2006

Do Expectancies Mediate the Relationship Between Sensitivities and Fearfulness?: An Alternative to Reiss' Expectancy Theory

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A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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December 2006

Acknowledgements

I would first like to thank my parents, Linda and David Ward, and the rest of my family for their tremendous and unwavering support. Should I not have listened to my Grandparent McMillen's advice to "do it while you're young… if you want to go see the world, then do it," I never would have developed the maturity and vision to discover and travel this exciting path.

My six years as a clinical psychology graduate student at VCU has been an amazing and rewarding experience, both in and out of the classroom, lecture hall, clinic and lab. I would like to offer my gratitude to my advisor, Scott Vrana, whose knowledge, advice, encouragement, occasional nudging, and most of all his time and commitment to providing an excellent training environment has had an immense impact on my professional development. I am also grateful to my dissertation committee members and the many, many individuals on faculty and staff in the department and beyond whom I have learned from or simply shared a few memorable laughs.

My thanks go out to Lisa Jobe for her invaluable assistance with data collection and to Nathan Hartman for his apparently bottomless cornucopia of SEM resources. And finally, I would like to acknowledge the courage, patience, and profound and unconditional support I have received from Sydney, my wife, friend, and colleague.

Thank you.

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Abstract

DO EXPECTANCIES MEDIATE THE RELATIONSHIP BETWEEN SENSITIVITIES AND FEARFULNESS?: AN ALTERNATIVE TO REISS'S EXPECTANCY THEORY

By Scott David McDonald, M.S.

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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This paper tests Reiss' (1991) expectancy theory of fearfulness. Reiss' moderation model of fears speculates that individual differences in fearfulness and phobic avoidance is a function of the interaction between trait vulnerabilities (i.e., sensitivities) and beliefs about potential outcomes during exposure to phobic stimuli (i.e., expectancies). Four hundred and forty-five undergraduates completed questionnaires related to Reiss' fundamental sensitivities (e.g., "anxiety sensitivity"), expectancies (e.g., "expectancy of physical injury or harm") and the intensity of common fears. Informed by findings concerning fear-related outcome expectancies, a system for measuring expectancies was developed for this study called the Focus of Apprehension Survey Schedule (FASS). Additionally, “disgust sensitivity” and “expectancy of contamination or illness” were included to examine whether they account for fearfulness beyond that predicted by Reiss’ sensitivities and expectancies alone. In Experiment 1, hierarchical multivariate regression was employed to test Reiss’ moderation model of expectancy theory for four fear subtypes (animal, blood/injection/injury (BII), claustrophobic, social). For each of these fear types, results did not support Reiss’ moderation model. However, disgust sensitivity improved the prediction of animal fears and contamination expectancies improved the prediction of BII fears beyond Reiss’ fundamental sensitivities and expectancies alone. In Experiment 2, a competing mediation model of expectancy theory was tested in which sensitivities were expected to indirectly influence individual differences in fearfulness through outcome expectancies. Results of path analysis using LISREL 8.54 did not support a mediation model per se. However, expectancies were found to mediate relationships between sensitivities and fears in several predicted instances (e.g., contamination expectancies mediated the disgust-BII fears relationship). The results provide some encouraging replications of prior studies and are discussed in the context of implications for theories of fear as well as for future directions in research.

Introduction

It seems that we come into the world ready to be frightened... (J. A. Gray, 1987)

Theories concerning the etiology, maintenance, and prediction of fears and phobias form the foundations for clinical interventions. The confirming, confuting, or revising of these theories is an important preliminary step toward creating the most effective treatments, as well as influencing the direction of future research. Within the past three decades, theories of emotion that integrate expressive-behavioral, neurobiological, and cognitive components have deepened our understanding of the emotional experience (Barlow, 2002). Fear is considered one of the most basic of emotions (Izard, 1977) yet after decades of research investigators continue to develop new insights into associated biological and psychological vulnerabilities, genetic transmission, and fear-relevant cognitive processes. The purpose of this study is to test the accuracy of one important model of fearfulness, Reiss' expectancy theory (Reiss & McNally, 1985; Reiss, 1991). Toward that end, two competing models of expectancy theory are examined, a moderation model and a mediation model. The goal of this study is to design methods and analytic strategies to test expectancy theory that take into account the most recent developments in our understanding of fears and phobias.

This manuscript first provides a history of major theories of fear. Second, a description of Reiss' expectancy theory and an overview of supporting literature are provided. Subsequently, the limitations of prior studies of expectancy theory are discussed as well as proposals for improving methods and measures. Fourth, it is proposed that disgust sensitivity and related outcome expectancies should be included in expectancy theory to improve the prediction of fears. Next, Experiment 1 provides a test of a moderation model of expectancy theory and Experiment 2 provides a test of a mediation model of expectancy theory. And finally, a discussion of the findings, implications, limitations, and suggestions for future research is provided.

Theories of Fear Acquisition

Pavlovian conditioning served as the most prominent and widely-accepted theory for explaining the onset of fears through the first half of the 20th century (Rachman, 2002). In this view, when a neutral stimulus is paired in temporal contiguity with an aversive, fear-relevant event or stimulus, the neutral stimulus will subsequently elicit a fear response. The neutral stimulus is called a conditioned stimulus (CS) whereas the aversive event or stimulus is called the unconditioned stimulus (US). The degree of fear conditioning is contingent on several factors including the temporal proximity of the CS to the US, the number of CS/US pairings, and physical properties of the stimuli. The Pavlovian conditioning paradigm was instrumental as the theoretical basis of many behaviorally-based treatments, such as systematic desensitization (Wolpe, 1958).

However, the limitations of Pavlovian conditioning in explaining fear acquisition were becoming very apparent by the late 1970s. In addition to studies indicating that the US/CS contiguity requirement for Pavlovian conditioning did not always hold true (see Rescorla, 1988), conditioning theories were not able to explain the observation that fear could be developed through vicarious means (e.g., seeing someone attacked by a dog) and information (e.g., being warned that AIDS can be contracted from public toilets) (Rachman, 2002).

One of the major breakthroughs at that time was Wagner and Rescorla's (1972) observation that Pavlovian associations are adjusted when an organism perceives a discrepancy between expected outcome and true outcome. The result is that if an outcome is more aversive than expected, the expectation of a negative outcome is strengthened. Alternatively, if the outcome is less aversive than expected, the negative outcome expectancy is weakened. For example, if a person who is moderately apprehensive about dogs pets a neighbor's Golden Retriever without being attacked, his or her apprehension will weaken. On the other hand, if he or she is attacked by the neighbor's dog, the expectancy that dogs will bite will strengthen. Such studies provided strong evidence that Pavlovian conditioning's reliance CS/US contiguity was incomplete, and expectation about potential outcomes of presentation of the phobic stimulus was an important contributor to fear.

Wagner and Rescorla's (1972) findings fit well with the contemporaneous cognitive revolution and accompanying theories of emotion (Bandura, 1986, 1988; Beck, 1976; Rachman 1978) which emphasized that belief about dangers or threats are central to the maintenance of anxiety (Thorpe & Salkovskis, 1995). Moreover, their findings are consistent with the concept that exposure treatments for phobias are effective due to the changing of beliefs, rather than habituation alone (Foa & Kozak, 1986; Salkovskis, 1991). A good deal of support for cognitive theories of fear surfaced at this time, such as the consistent finding that distorted beliefs about phobic stimuli are common among individuals with specific phobias, panic disorder, and social phobia (for a review, see Barlow, 2002, Ch. 11). These distorted beliefs include higher estimates of harmful outcomes (e.g., Menzies & Clark, 1995; Pauli, Wiedemann, & Montoya, 1998), expected fear level (e.g., Telch, Ilai, Valentiner, & Craske, 1994) and distorted perceptions (e.g., Riskind, Moore, & Bowley, 1995). By the end of the 1980s, it was clear that thoughts and beliefs were important components in the maintenance and acquisition of fears.

Throughout the 1970s, researchers were also exploring biological vulnerabilities associated with fear acquisition and maintenance. One such theory, "biological preparedness" (McNally, 1987; Mineka & Öhman, 2002; Öhman, Dimberg, & Öst, 1985; Seligman, 1971), posits that humans are more biologically prone to become aversively conditioned to certain situations or objects that presented threats to pretechnological man (e.g., spiders, snakes, storms). For example, a fear of snakes has survival value in that it leads to vigilance and avoidance and therefore a lesser chance of receiving a potentially fatal bite. Although several studies have provided limited evidence for the biological preparedness theory (see Öhman & Mineka, 2001 for a review), interpretations of these findings remain mixed (Davey, 1995; de Jong, & Merckelbach, 1997). A related non-associative model suggests that Darwinian natural selection has produced innate fears which we learn to "unfear" through life experiences (Marks, 1987; Poulton & Menzies, 2002; Rachman, 1978).

Other vulnerability theories have their roots in psychobiological theories of learning and personality (e.g., Cloninger, 1998; Cloninger, Svrakic, & Przybeck, 1993; Eysenck, 1967; Gray, 1976). For example, in Cloninger's seven-factor model of personality, a measurable trait called "harm avoidance" is an inherited tendency to be "predisposed to form conditioned signals of punishment and frustrative non-reward (i.e., they worry and are easily frightened) and to be sensitive to passive avoidance learning" (Cloninger, 1998, p. 71). There are several studies supporting Cloninger's assertion that harm avoidance is associated with the behavioral inhibition brain system (Gray, 1976) and the neurotransmitter GABA. For example, harm avoidance, as measured by a self-report questionnaire (Cloninger et al., 1993) is correlated with individual variation in Pavlovian aversive conditioning (Corr, Pickering, & Gray, 1995). In contrast with preparedness theory and non-associative models, Cloninger's theory refers to individual differences in a proclivity to developing fears without regard for the relative conditionabilty of various stimuli.

Results of genetic liability and heritability studies also suggest that inherited, biological mechanisms influence susceptibility to the development of fears and phobias (e.g., Fyer et al., 1990; Fyer, Mannuzza, Chapman, Martin, & Klein, 1995; Kendler, Karkowski, & Prescott, 1999). However, compared to Cloninger's (1993) model described above, results of genetic and heritability studies suggest that there are separate genetic effects for general fearfulness and for specific phobia subtypes (e.g., animal, social, blood/injury, agoraphobic) (Kendler et al., 1999; Kendler, Myers, & Prescott, 2002). It is interesting to note that although the bulk of these studies focus on heritability of phobias, twin studies have shown that the same genetic factors that influence phobias affect fearfulness, suggesting that phobias represent an extreme on the continuum of fear rather than qualitatively different phenomena (Kendler, et al., 1999; Kendler, Myers, Prescott, & Neale, 2001).

This section reviewed several perspectives on fear acquisition and maintenance. It is important to point out that modern competing theories of fear acquisition rarely rely on only one mechanism to explain individual differences, be it associative, cognitive, biological, personality or genetic. More often, perspectives on the etiology of fears and phobias involve consideration of the relationships between learning experiences, thoughts, and psychological or biological vulnerabilities (see *Behaviour Research and Therapy* 40, 2002 for several perspectives). The next section describes one such theory, Reiss' expectancy theory.

Description of Reiss' Expectancy Theory

Reiss' expectancy theory (Reiss 1991; Reiss & McNally, 1985) was developed to account for individual differences in the intensity of fears, the acquisition of phobias, and avoidance behavior. Expectancy theory might best be characterized as a neo-conditioning perspective (Rachman, 1991; Rescorla, 1988) which builds on Pavlovian conditioning models by allowing for the effects of cognitive appraisals. The expectancy theory proposes that individual variance in fears can be explained by trait-like psychological vulnerabilities and expectations about what will happen during encounters with feared objects or situations. More specifically, these psychological vulnerabilities, called "sensitivities" in Reiss's model, interact with outcome "expectancies" (what one thinks will happen when the feared object or situation is encountered) to determine fearfulness. For example, an individual who is concerned that elevators are unsafe (expectancy) will become more fearful if he or she has a tendency to worry about becoming injured in a variety of situations (sensitivity).

Expectancies

The original conceptualization of expectancy theory (Reiss, 1980) explicitly recognized that the US/CS contiguity was not enough to explain the acquisition of most if not all fears. Drawing from the works of Wagner and Rescorla (1972), expectancy theory regards information gained about the relationship between US and CS association as more important that the US/CS contiguity in developing a CR. In regards to fear acquisition, the relationship between information and fearfulness is mediated by expectancies about potential outcomes. Reiss (1980) identified two fear-relevant expectancies: expectancies about the dangerousness of a stimulus and expectancies about the ability of the stimulus to induce anxiety. A stimulus may evoke fear due to danger expectancies, anxiety expectancies, or a combination of both. If an individual receives information through one of these channels that is inconsistent to currently held expectancies, the expectancies (and therefore the fear response to the stimulus) will be modified accordingly. For example, if an individual has strong expectations of falling off a ladder and being injured, the safe use of a ladder will attenuate the belief in the dangerousness of climbing a latter and subsequently reduce associated fear. Furthermore, for a different individual, just hearing about the safety of ladders of having another person model the climb is enough to reduce expectancies of harm with the result of reducing fear.

Expectancy theory is neutral on the actual mechanisms of fear acquisition and recognizes that expectancies can be developed through various processes: cognitive learning, Pavlovian conditioning, covert conditioning, modeling, or a combination of these means (Reiss & McNally, 1985). Subsequently, modifications in the strength of fearfulness can occur through various means as well. For example, an individual may reduce his or her fears of ladders by climbing one successfully, watching another person climb, or possibly by listening to various accounts of successful ladder-climbs. However, central to expectancy theory is that the ability of a stimulus to elicit fear is dependent on outcome expectancies and which can be modified through learning.

The current conceptualization of expectancy theory (Reiss, 1991) regards all expected outcomes as belonging to one of three classes of expectancies: *expectancies of physical injury*, *expectancies of anxiety*, and *expectancies of embarrassment*. For example, McNally and Stekette (1985) found that most expectancies of animal phobia patients concerned about being harmed by the animal (an injury expectancy), panic reactions (an anxiety expectancy), or both. Gursky and Reiss (1987) also provided evidence for the distinctiveness of expectancies, in that a factor analysis of an anxiety and danger (i.e., injury) expectancy questionnaire for specific fears extracted two factors corresponding to danger and anxiety-related expectations.

Sensitivities

Reiss's (1980) earliest version of expectancy theory was later revised to account for vulnerabilities to fear acquisition (Reiss, 1991; Reiss & McNally, 1985). Expectancy theory's inclusion of trait vulnerabilities stems from models of fear acquisition that emphasize biological or early-developed vulnerabilities to developing common fears. Accordingly, it was proposed that all common fears have roots in three trait-like, fundamental "sensitivities" to fear-relevant stimuli: injury (i.e., danger) sensitivity (IS), fear of negative evaluation (FNE), and anxiety sensitivity (AS). The fundamental fears are statistically distinct (Taylor, 1993) and theoretically distinguishable from anxiety, fears, and panic (e.g., Reiss, Peterson, & Gursky, 1988). *Injury sensitivity* (IS), sometimes called "danger sensitivity," refers simply to a tendency to fear becoming injured, ill, or dying. It is thought to reflect a tendency to fear and avoid situations or objects that may be harmful. *Fear of negative evaluation* (FNE) refers to apprehension of being evaluated negatively, an avoidance of evaluative situations, and an overly pessimistic belief that one will be negatively evaluated (Watson & Friend, 1969). Not surprisingly then, this sensitivity is characterized by a heightened expectation of negative evaluation in social situations. *Anxiety sensitivity* (AS), the most investigated sensitivity, refers to a belief that cognitive and physical symptoms of anxiety are harmful or dangerous. Compared to control subjects, AS scores tend to be higher for individuals with anxiety disorders (Taylor, 1996; Taylor, Koch, & McNally, 1992), predict who will develop panic attacks (Ehlers, 1995; Maller & Reiss, 1992; Schmidt, Lerew, & Jackson, 1997, 1999), and predict anxious responding to hyperventilation challenges (Rapee & Medoro, 1994). It is important to note that in each of these studies the effects of AS were significant even after trait anxiety was controlled, suggesting that although related, AS and trait anxiety are separable constructs (McNally, 1993).

Although both expectancy theory and preparedness theories (e.g., Seligman, 1971) predict vulnerabilities in the development of fears, they can be contrasted on the nature of the vulnerability. Expectancy theory posits that the sensitivities are fundamentally aversive and that particular stimuli are feared because of their association with the fundamental sensitivity. Preparedness theories, on the other hand, speculate that susceptibilities are specific to one or a small group of stimuli such as spiders and blood. Another point of contrast with preparedness and non-associative models of fear is that expectancy theory is neutral concerning whether there is an evolutionary advantage for sensitivities.

Sensitivities can also be contrasted with biologically-based vulnerability models (e.g., Cloninger et al., 1993) in that expectancy theory is neutral to whether sensitivities can be related to specific brain systems. Nonetheless, there is some indication that anxiety sensitivity predicts activation of the medial prefrontal cortex (Ochsner, Ludlow, & Knierim, 2006) and individuals who report greater social anxiety (who generally score highly on fear of negative evaluation) tend to demonstrate greater amygdala activity in response to social fear-relevant stimuli (Killgore, & Yurgelun-Todd, 2005; Pine, 2001).

Expectancy theory is broadly consistent with genetic approaches to fears that suggest that individual fears share a reduced set of common vulnerabilities. However, whereas recent studies using multivariate genetic analysis describe both general and specific genetic liability associated with phobia subtypes (e.g., Kendler, Myers, Prescott, & Neale, 2001), expectancy theory posits that each of the three fundamental sensitivities can concurrently influence any particular fear (though not necessarily equivalent influence, as will be discussed below). Furthermore, expectancy theory does not predict a general phobic liability, nor does it regard the three sensitivities to be reducible to a general, higher order construct.

Although expectancy theory and models of fear based on multivariate genetic analytic methods have important theoretical differences, several studies have demonstrated that Reiss's fundamental sensitivities have heritability and/or genetic transmission. For example, the heritability of anxiety sensitivity has been examined in several studies. Stein, Jang, & Livesley (2002) reported that 45% of the variance in anxiety sensitivity was attributed to genetic contributions. Of particular relevance were those items related to beliefs that anxiety-related bodily sensations were harmful. In another study, Jang, Stein, Taylor, & Livesley (1999) reported that anxiety sensitivity is particularly heritable for women. van Beek & Griez (2003) found that healthy first-degree relatives of panic disorder patients scored significantly higher on a measure of anxiety sensitivity (Anxiety Sensitivity Index; Reiss, Peterson, Gursky, & McNally, 1986) than control subjects, suggesting that anxiety sensitivity is influenced by familial factors, even before the onset of panic disorder. Only one study to date has examined the genetic contribution to fear of negative evaluation, although the heritability of social phobia has been demonstrated by several studies (e.g., Fyer, Manuzza, Chapman, Liebowitz, & Klein, 1993; Kendler, Neale, Kessler, Heath, & Eaves, 1992). Stein and colleagues (2002), utilizing a twin study design, found that the fear of being negatively evaluated is moderately heritable, with genetic factors accounting for 48% of the variance.

Sensitivities x Expectancies.

Expectancy theory posits that fearfulness is best understood as a function of the interaction between an expectancy of aversive outcomes and psychological vulnerabilities in the form of sensitivities. Each of the three expectancies corresponds to one of the three sensitivities: expectancies of physical injury to injury sensitivity, expectancies of anxiety to anxiety sensitivity, and expectancies of embarrassment to fear of negative evaluation. Individuals reporting a strong, aversive expectancy (e.g., “the dog will bite”) and a powerful, matching sensitivity (e.g., “it would be terrible to be physically injured”) will be particularly susceptible to developing a phobia. Reiss (1991) illustrates expectancy theory as a formula, which is presented below:

$$\text{Fear of a specific stimuli} = \alpha\,\Sigma\,(\text{expectancy}_1 \text{ X sensitivity}_1) + \beta\,\Sigma\,(\text{expectancy}_2 \text{ X sensitivity}_2) + \gamma\,\Sigma\,(\text{expectancy}_3 \text{ X sensitivity}_3)$$

This formula demonstrates that common fears are a function of the additive effects of three interactions of associated expectancies and sensitivities. Interaction 1 is between all possible expectancies of disaster (e.g., “The train I’m in could crash”) and injury sensitivity (e.g., “It would be terrible if I were to be injured”). Interaction 2 is between all possible expectancies of anxiety (e.g., “I will have a panic attack if I enter this crowded train”) and anxiety sensitivity (e.g., “I could go crazy if my anxiety is too intense”). Interaction 3 is between all possible expectancies of social disaster (e.g., “Everyone will be looking at and evaluating me if I step onto this train”) and fear of negative evaluation (e.g., “It would be terrible to be judged harshly”). In Reiss’s model, the symbols α, β, and γ are undefined weights. An illustration of expectancy theory is provided in Figure 1.

The conceptualization of fears as a function of trait vulnerabilities and outcome expectancies is likely the most striking feature of expectancy theory, and also the least well developed. Subsequently, one of the primary aims of this study is to examine the validity of this interaction model.

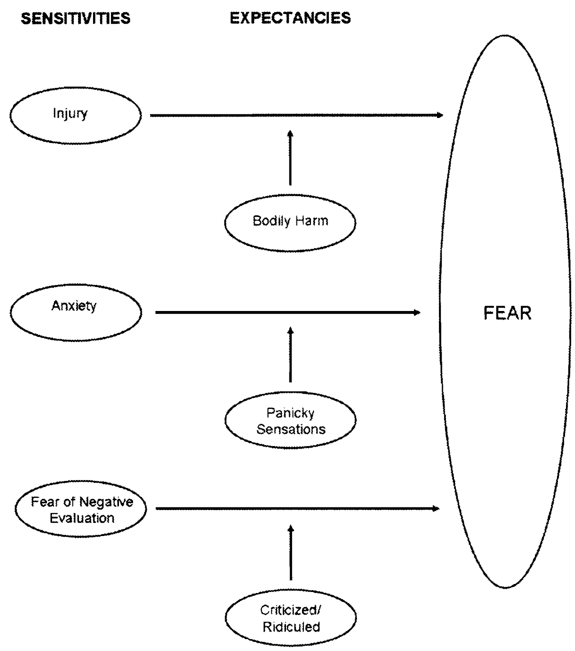

Figure 1. Reiss' moderation model of expectancy theory.

In summary, Reiss's (1991) expectancy theory of fear development deviates from a traditional Pavlovian conditioning approach in its inclusion of cognitive factors, namely outcome expectancies. In that regard, it is similar to the neo-conditioning tradition but diverges in its emphasis on the interaction between sensitivities and expectancies. Finally, although expectancy theory does not predict a genetic or biological basis for sensitivities, evidence indicates that anxiety sensitivity and fear of negative evaluation are associated with discrete brain structures and are moderately influenced by genetic effects. These findings lend support to the contention that sensitivities are lasting traits.

Support for Expectancy Theory

Few studies have directly evaluated Reiss's expectancy theory (Reiss, 1991), and no study has yet comprehensively examined his model. However, although significant main effects are not required by expectancy theory, a collection of studies have provided support for the main effects of sensitivities and expectancies in predicting fearfulness. This section first reviews evidence for a relationship between sensitivities and common fears. Second, the evidence for a relationship between expectancies and fearfulness are examined. Third, the few studies that have tested expectancy theory and their findings are summarized. And finally, limitations of prior research are summarized and a proposal for resolving these limitations and enriching the research base on expectancy theory is offered.

Relationship of Sensitivities to Common Fears

As reviewed above, sensitivities are defined by their inherent aversiveness and inability to be reduced to more basic fears. In contrast, common fears (e.g., fears of snakes, social situations, and enclosed spaces) can be reduced to these broader fears. Over thirty years ago, Watson and Friend (1969) observed that the variance in social fears can largely be explained by the more broad fear of negative evaluation. Currently, the idea that a trait-like vulnerability exists and influences social fears is core to modern theories about social phobia (Leary, Kowalski, & Campbell, 1988; Rapee & Heimberg, 1997). Individuals with social phobia consistently score higher on questionnaires of fear of negative evaluation than other clinical groups and controls (Heimberg, Hope, Rapee & Bruch, 1988). Also, a strong positive correlation between measures of fear of negative evaluation and measures of social anxiety and avoidance has been found (Jones, Briggs & Smith, 1986; Taylor, 1993; Watson & Friend, 1969). Fear of negative evaluation has also been found to discriminate between socially anxious and non-anxious controls on their behavior during a social encounter (Asendorpf, 1987). However, it should be noted that fear of negative evaluation may also contribute to or intensify other common fears (Taylor, 1993). For example, an individual may become distressed by dogs out of a fear of being attacked, but an expectation of being ridiculed for that fear may lead to greater distress and avoidance (Taylor & Fedoroff, 1999).

It is well-established that anxiety sensitivity is elevated in panic disorder (see review in McNally, 2002) and agoraphobia (McNally & Lorenz, 1987; Taylor, 1993) compared to patients with other anxiety disorders and healthy controls. However, anxiety sensitivity also tends to be elevated in other phobia-related disorders such as claustrophobia (e.g., Öst & Csatlos, 2000), dental phobia (e.g., Locker, Shapiro, & Liddell, 1997) and fainting in blood phobias (e.g., Kleinknecht, 1988). Locker and colleagues (1997) further found that patients with multiple phobias (dental and blood) had higher anxiety sensitivity than patients with only one specific phobia or controls. Individuals with social phobias tend to have higher anxiety sensitivity as well (e.g., Ball, Otto, Pollack, Uccello& Rosenbaum, 1995). However, it is unclear whether these elevations are due to the three socially-relevant questions on the measure used (e.g., "It is important for me not to appear nervous.") rather than a more general fear of anxiety (Cox, Borger, & Enns, 1999).

Only one study has adequately examined the relationship between injury sensitivity and common fears. In an early test of expectancy theory, Taylor (1993) developed the Injury Sensitivity Index (ISI) to measure injury sensitivity. The ISI was developed in response to the reliance by prior researchers (e.g., Reiss, et. al, 1988) on injury-related fear surveys, which tended to create a redundancy between the sensitivity measure and the Blood/Injury/Injection (BII) items on fear surveys. Taylor found that although zero-order correlations were positive and significant between ISI and a broad range of fears, results of canonical correlation suggested the ISI is most strongly related to BII fears.

An important result of Taylor's (1993) study was the finding that multiple sensitivities may predict unique variance in any one fear. Taylor examined the relationships between sensitivities and four subscales of a modified version of the Fear Survey Schedule-III (FSS-III; Wolpe & Lang, 1964): social fears, animal fears, BII (and death) fears, and situational (or "agoraphobic") fears. Using regression analyses, the three sensitivities were significant predictors for each of the four common fear subtypes accounting for 22-41% of the variance in each. All sensitivities were significant predictors of each common fear subtypes, although zero-order correlations and magnitudes of beta weights suggested that the relationships between sensitivities and common fear subtypes were variable: fear of negative evaluation was most strongly related to social and animal fears; injury sensitivity was most strongly related to blood-injury fears and animal fears; and anxiety sensitivity was most strongly related to agoraphobia. Results of a canonical correlation suggested that fear of negative evaluation and injury sensitivity were related to all common fear groups including trait anxiety, suggesting a more broad effect. However, injury sensitivity was strongly associated with blood-injury fears in the absence of fear of negative evaluation and anxiety sensitivity. Anxiety sensitivity was strongly associated with agoraphobia in the absence of fear of negative evaluation. Taylor (1993) concluded that the three sensitivities accounted for a substantial amount of the variance in common fears (22-41%) with the remaining unexplained variance due to participant differences in learning histories (such as aversive events or lack thereof with various measured stimuli) and the interaction of environmental events and sensitivities.

In summary, there is good support for expectancy theory's claim that the three sensitivities are associated with common fears. Fear of negative evaluation is most commonly associated with social fears, although it appears to generally be positively correlated with other fears as well (e.g., animal fears). Anxiety sensitivity is strongly associated with agoraphobia and claustrophobia, and to a lesser extent, BII and social fears. Injury sensitivity has only been adequately investigated in one study, which indicated correlations with a broad array of fears, but was most strongly related to BII fears.

Relationship of Expectancies to Common Fears

Traditional theories of phobias have assumed that individuals fear objects or situations due to expectations of being harmed or injured (e.g., bitten by a snake, car crash, trapped in an elevator and suffocating; Craske et. al., 1996). However, there is now evidence of considerable variety in phobic apprehension depending on the target phobic stimulus. Notwithstanding the various methods of data collection and coding strategies, the findings related to the relationship between expectancies and common fears and phobias have been fairly consistent (see review in Craske et. al., 1996). Generally, social phobics tend to expect negative evaluation in social situations, such as criticism, ridicule, and embarrassment (Asendorpf, 1987; Foa, Franklin, Perry, & Herbert, 1996; Leary et al., 1988; Uren, Szabó, & Lovibond, 2004).

Outcome expectancies in specific phobias tends to be classifiable as either concerns about harm or injury or concerns about panicking or losing control (Gursky & Reiss, 1987; Reiss, et al., 1988). For example, situational fears tend to be associated with fear of anxiety-relevant bodily sensations (Craske & Sipas, 1992; McNally, 1990; Reiss, 1991; Taylor et al., 1992; but see Lipsitz, Barlow, Mannuzza, Hofmann, & Fyer, 2002), although individuals who specifically report fears of enclosed spaces tend to expect injurious consequences (Lipsitz et al., 2002). On the other hand, those with animal phobias (Antony, Brown, & Barlow, 1997; Lipsitz et al., 2002; McNally & Steketee, 1985) and BII phobias (Lipsitz et al., 2002) tend to be concerned both with physical harm and with experiencing panic or losing control.

As suggested by the findings for animal phobias, it is common that more than one expectancy is experienced in differing intensities. One example comes from McNally and Stekette (1985), who interviewed 22 adults with severe animal phobias using structured interviews. About half (10) of the participants were seeking treatment for snake fears, with the other 12 reporting fears of cats, birds, dogs, or spiders. They found that 41% expected physical attack, 91% expected panic attacks, 18% expected to "go insane from fear," 14% expected embarrassment, 14% expected to become injured while trying to run away, and 9% expected a heart attack. This suggests not only that less than half of the patients expected to be harmed by the animal (an injury expectancy), but also that most expected panic reactions (an anxiety expectancy). Therefore, in this sample, there were a considerable number of patients who expected both injury from the animal as well as expected strong anxiety.

In another study, Lipsitz and colleagues (2002) found that a substantial number of the patients reported no single focus of apprehension toward their phobic stimulus: 25% of animal, 9% of situational, 16% blood/injury, and 9% natural environment phobia patients reported multiple foci. Antony and colleagues (1997) used a forced-choice response format to ask 60 patients with specific phobia the percentage of their expected fear that was due to possible negative outcomes related to their physical sensations (e.g., fainting, heart attack, going crazy) versus possible negative outcomes due to other external factors (e.g., getting hit by a car, getting bit by a dog). The mean ratings for the percentage of expected fear due to harmful physical sensations ranged from 17-32% for the phobia subtypes of heights, blood, and driving, whereas the percentage was only about 4% for animal phobia, indicating that most phobics (sans animal phobics) reported both fear of bodily harm and of bodily sensations during encounters with phobic stimuli. Notwithstanding phobic group differences, the results of the studies by McNally and Stekette (1985), Lipsitz and colleagues and Antony and colleagues suggest that an individual may conjure not just one but multiple expectancies about an encounter with a feared object or situation.

In summary, there is strong support that expectancies are related to fears and phobias. Furthermore, it is clear that multiple outcome expectancies can be held at once, making it important to document relevant expectancies. Unfortunately, these conclusions are based on a patchwork of studies using different methodologies with specific populations. A more comprehensive study that uses a uniform method to examine multiple fears simultaneously is needed to provide a better understanding of the relationship between expectations and fears.

Sensitivities x Expectancies

An empirical evaluation of expectancy theory should test whether the interaction between sensitivities and expectancies predict fearfulness (Taylor & Fedoroff, 1999). To date, few studies have been conducted that meet this criterion, and no study has included fear of negative evaluation and its matching expectancy. One such study examined an earlier version of expectancy theory (Reiss & McNally, 1985) with a sample of 117 college students with fears of enclosed spaces (Valentiner, Telch, Ilai, & Hehmsoth, 1993). Results indicated that danger expectancy, anxiety expectancy, and the interaction between anxiety sensitivity and anxiety expectancy predicted avoidance behavior (as measured by time spent in a long, darkened, dead-end corridor), but did not predict heart rate reactivity or self-reported fear. Therefore, only limited support was provided for expectancy theory.

Another study was conducted with 94 college students with snake fears (Schoenberger, Kirsch, & Rosengard, 1991 as cited in Taylor & Fedoroff, 1999). Participants completed measures of danger sensitivity (i.e., IS), anxiety expectancy, expected danger, expected anxiety, and ratings of fearfulness when asked to approach and touch a live snake. Hierarchical multiple regression analyses were conducted with main effects of sensitivity and expectancy in the first step and interaction terms (danger sensitivity X expected danger; anxiety expectancy X expected anxiety) in the second, with self-reported fear as the dependent variable. Results indicated that the danger sensitivity X danger expectancy interaction was significant ($p < .02$) and the anxiety sensitivity X anxiety expectancy was significant with a less conservative alpha of < .10 ($p < .06$). Subsequently, a series of three regression analyses (low, medium, and high danger expectancy) were conducted to examine the ability of danger sensitivity to predict self-reported fear at varying levels of danger expectancy. The results revealed that as danger expectancy scores increased, the regression coefficients for danger sensitivity decreased. In contrast to anticipated results, the authors concluded that the findings were in the direct opposite direction that expectancy theory would predict.

A third study (Telch & Harrington, 1994 as cited in Taylor & Fedoroff, 1999) manipulated participant expectations about the effects of inhaling a mixture of 35% CO_2 and 65% O_2, a compound commonly used to elicit arousal-related physical sensations. Thirty-nine high and forty low anxiety expectancy college students were told before the trial either that inhaling the mixture would be relaxing or arousing, creating a crossed factorial design. Counter to expectations, rates of reporting panic for those in the high anxiety sensitivity group were higher for the group expecting relaxation (52%) than for the group expecting arousal (17%). In comparison, only about 5% of those in the low anxiety sensitivity group reported panic, regardless of the instructions provided. Therefore, although the high anxiety sensitivity group tended to report panic more often than the low anxiety sensitivity group in response to the CO_2 challenge, the results indicated that expectations of arousal decreased rates of panic in high anxiety sensitivity individuals. Although these findings were inconsistent with expectancy theory, it is possible that other factors were instrumental, such as effective coping by those in the high anxiety sensitivity group who expected arousal or the outcome expectancies provided by the experimenters may have been less convincing than the participants' independent expectations.

In summary, little evidence exists for the prediction of expectancy theory that fearfulness is a function of the positive interaction between sensitivities and expectancies. That is, the addition of interaction terms does not appear to improve the prediction of fears beyond sensitivities and expectancies alone. In fact, in two of the studies reviewed here, the effects of the interactions were in the opposite direction expected. On the other hand, these studies suffered several significant limitations.

Limitations of Prior Research on Expectancy Theory

First, the studies reviewed above included only a subset of sensitivities and expectancies. A true test of Reiss's expectancy theory should include each of the three fundamental sensitivities and associated expectancies. Second, participants in the first two studies were fearful of the target stimulus, presumably resulting in a restricted range of the dependent variable. Third, subsequent research has suggested improvements in the measuring of sensitivities and elucidated the most common outcome expectations related to phobic stimuli, allowing more accurate measurement of expectancies. Finally, recent findings suggest that expectancy theory ignores another set of fear-relevant sensitivities and expectancies, disgust sensitivity (Rozin, Fallon, & Mandell, 1984) and expectancies of contamination or illness (Lipsitz et al., 2002). The first limitation, lack of comprehensiveness, was resolved in the design of the current study and can be inferred from the methods outlined below. Concerning the potential effects on the dependent variable (i.e., fearfulness) of using only highly fearful individuals, the current study included participants with a broad range of fearfulness. More in-depth consideration of the final two issues (improving measures and the addition of disgust sensitivity and expectancies of contamination), and proposals for resolving them, are presented in separate sections below.

Improvements in the Measures Associated with Expectancy Theory

Sensitivities

Updated measures have recently become available for more precise and reliable measurement of Reiss' three fundamental sensitivities. For example, several studies have been conducted recently concerning the psychometric properties of the Brief Fear of Negative Evaluation scale (BFNE; Leary, 1983). Most notably, Rodebaugh and colleagues (2004) examined the properties of the 12-item BFNE compared to the original 30-item Fear of Negative Evaluation scale (FNE; Watson & Friend, 1969). They found that the straightforwardly-worded subset of eight items on the BFNE was more reliable, discriminating, and related to other measures of social anxiety than either the FNE or the 12-item BFNE.

There has been some debate on whether the 16-item Anxiety Sensitivity Index (ASI; Reiss et al., 1986) should be considered multidimensional, as the measure has been found to consist of three lower-order factors loading on one higher-order factor (see review in Zinbarg, Mohlman & Hong, 1999). One common nomenclature for these factors is Physical Concerns (e.g., "It scares me when my heart beats rapidly"), Mental Incapacitation Concerns (e.g., "When I am nervous, I worry that I may be mentally ill."), and Social Concerns (e.g., "It is important for me not to appear nervous") (Zinbarg et al., 1997). However, several authors (Blais et al., 2001; Schmidt & Joiner, 2002) have suggested removing five or six problematic items, which included the two comprising the social concerns scale, from the ASI. Since the two social concern items factored with items from the BFNE rather than with other ASI items in the Taylor (1993) study, removal of these items should result in a more discriminate and sensitive measure.

Elimination of problematic items on the ASI has generally resulted in a robust two-factor questionnaire that includes dimensions of fear of anxiety-relevant bodily sensations and fear of anxiety-related cognitions (Blais et al., 2001; Keogh, 2004; Schmidt & Joiner, 2002). Furthermore, exploratory factor analyses conducted on archival data sets in our lab have generally extracted these two factors. Therefore, a preliminary CFA of the 11-item ASI (Blais et al., 2001) was conducted to test the adequacy of the two-factor model. As predicted, a two-factor model, compared to a one-factor model, provided a superior fit to the data (Appendix A). Although prior examinations of expectancy theory have utilized the ASI as a one-dimensional construct of anxiety sensitivity (e.g., Taylor, 1993), examining the dimensions of the ASI separately may improve prediction of fear-related cognitions (Cox, 1996), phobic behavior (Taylor & Federoff, 1999), and differential diagnosis (Rodriguez, Bruce, Pagano, Spencer, & Keller, 2004). Therefore, two subscales from the 11-item ASI will be considered separate "sensitivities" in analyses: sensitivity to anxiety-related cognitions (ASI-COG) and sensitivity to anxiety-related physical symptoms (ASI-PHY).

Expectancies

Unlike the refined measures available to indicate the sensitivities, there is less consensus regarding the appropriate approach to measuring expectancies. Two issues, method of measurement and the number of expectancies assessed, were critical considerations in the development of the current study. Concerning the method of measuring expectancies, one strategy was used by Gursky and Reiss (1987), who developed stimulus-specific, 10-item danger and anxiety expectancy scales. Respondents rated on a 5-point Likert-type scale how often certain thoughts of danger occurred (e.g., "The plane might collide with another plane.") and how likely were various anxiety-related symptoms (e.g., "You might feel faint."). A considerable drawback of this strategy is that an individual may have a very strong expectation of one potentially aversive outcome, yet score lower on the scale than another respondent who tends to rate each potential outcome as somewhat possible.

Another strategy is to obtain a rating of the perceived dangerousness, anxiety-eliciting nature, or embarrassment-evoking potential of a stimulus (Antony et al., 1997:

Valentiner et al., 1993). Although this method does not allow for the researchers to note the exact details of the expected outcome (e.g., two planes colliding, terrorist attack, mechanical malfunction), the respondent may provide an overall rating of dangerousness, anxiety-induction, or embarrassment that is not contingent on the number of possible scenarios feared by the participant. Another advantage of this method is that the same stem question can be used across fear stimuli. For example, one could be asked, "What do you think is the chance that you will be injured while… (driving a car, petting a dog, climbing a 10' ladder)." This latter strategy was used to measure expectancies in the current study.

Concerning the number of expectancies assessed, a primary concern was the linkage of one expectancy to each sensitivity (Reiss, 1991). Therefore, with four sensitivities identified, four expectancies are necessary. Several sources were used in determining the phrasing of each expectancy, including original sources for expectancy theory (e.g., Reiss, 1991), the DSM-IV (American Psychiatric Association, 1994), and the literature on phobias and non-clinical fears (e.g., Barlow, 2002; Lipsitz et al., 2004; McNally & Stekette, 1985). In addition, a pilot study is described below that was conducted to evaluate the comprehensiveness of a measure developed for this study.

The pilot study was conducted in our lab with 119 undergraduate students to examine a preliminary measure of expectancies. Participants were asked to rate the likelihood of five possible outcomes for a subset of 21 items: 1. "be physically injured in some way," 2. "experience panicky bodily sensations," 3. "experience disgust or revulsion," 4. "lose (mental) control or feel like I was 'going crazy,'" 5. "feel embarrassed." Instructions requested that participants to write in any expectation that was not covered by the choices provided.

The inclusion of "experience disgust or revulsion" as an expectancy deserves some comment. Although the aforementioned four general expectancies fit well with the tenets of expectancy theory and are consistent with commonly reported outcome expectations, clinicians have described various disgust-relevant expectations as well, such as concerns about becoming contaminated by a "dirty" dog (Lipsitz et al., 2002; McNally & Stekette, 1985). In addition, it is not uncommon for individuals to report expectancies of disgust or contamination when confronted with blood, wounds, and other BII fears (e.g., Lipsitz et al., 2002). Subsequently, an expectancy tapping "disgust or revulsion" was included for the pilot study.

For injury sensitivity, an expectancy of physical injury would appear to encompass the theoretical concept (Reiss, 1991) and is consistent with the wording used in other studies (e.g., Valentiner et al., 1993). For fear of negative evaluation, expectancies of being criticized, ridiculed, or embarrassed are consistent with common reports of feared outcomes both for social situations (Foa et al., 1996; Uren et al., 2004) and for contact with feared animals (McNally & Stekette, 1985).

In the original conceptualization of expectancy theory, anxiety sensitivity was thought to be a single-factor structure (Reiss et al., 1986). However, as reviewed above, there is considerable evidence that individual differences on the two subscales, sensitivity to anxiety-related cognitions (ASI-COG) and sensitivity to anxiety-related physical symptoms (ASI-PHY), be evaluated separately. For anxiety-related physical symptoms, a query of expectancies of panicky bodily sensations would be consistent with several reports about expected outcomes to encounters with phobic objects or situations (Lipsitz et al., 2002; McNally & Stekette, 1985) as well as prior studies of expectancy theory (Valentiner et al., 1993; Valentiner, Telch, Petruzzi, & Bolte, 1996). Sensitivity to anxiety-related cognitions relates to concerns about becoming insane or "going crazy" as a result of exposure to phobic stimuli, an outcome expectancy that also has been reported by patients with phobias (e.g., McNally & Stekette, 1985). Therefore, ASI-COG was matched with an expectancy of losing mental control or "going crazy."

Results of the pilot study indicated that expectancies varied by stimulus. For example, individuals with fears of snakes (rating a "5" on a fear scale) tended to expect panicky bodily sensations and disgust, whereas individuals with a fear of enclosed spaces tended to expect panicky bodily sensations and fear of losing control (Appendix B). There are several points worth mentioning concerning the results of this pilot study. First, ratings were largely consistent with prior findings, suggesting that this method of collecting expectancy data holds promise for accurate collection of expectancies. Second, only two participants wrote in additional expectancies (contamination-related), suggesting the five provided expectancies encompass most potential outcome expectancies. Third, the expectation of "disgust" was prominent, particularly for BII and animal stimuli. Although expectancy theory maintained that the three fundamental fears and their corresponding expectancies were sufficient to explain all common fears, the relationship between phobic behavior and disgust sensitivity has received a good deal of attention in recent years (see review in Woody & Teachman, 2000). The relevance of disgust and disgust sensitivity to expectancy theory is deliberated below.

Disgust Sensitivity and Its Relevance to Expectancy Theory

Although expectancy theory maintains that the three fundamental sensitivities and associated expectancies are sufficient to explain all common fears, the relationship between phobic behavior and disgust has received a good deal of attention in recent years (see review in Woody & Teachman, 2000). As noted above, a pilot study conducted in our lab and other reports (e.g., Lipsitz et al., 2002) provide evidence for the significance of disgust and contamination expectancies, especially pertaining to animal and BII fears.

However, it is the concept of *disgust sensitivity* that has received considerable attention. Disgust sensitivity is the tendency to feel disgusted toward various relevant stimuli (Haidt, McCauley, & Rozin, 1994; Rozin et al., 1984) and its relationship to avoidance of disgust-eliciting stimuli is thought to offer protection from contamination and disease (e.g., Matchett & Davey, 1991). Although disgust sensitivity is positively related to neuroticism (e.g., Quigley, Sherman, & Sherman, 1997) it is able to predict the unpleasant experience of disgust-elicitors after neuroticism is controlled. For example, Mulkens, de Jong, & Merckelbach (1996) found that disgust sensitivity continued to predict spider fear after the effects of neuroticism were removed (but see Muris, Merckelbach, Schmidt, & Tierney, 1999).

Measures of disgust sensitivity typically ask respondents to rate their comfort level or avoidance of various disgust-relevant stimuli or situations, such as touching a public toilet seat or drinking soup that was stirred with a used but washed fly swatter.

Disgust sensitivity has been found to be positively correlated with fears of disgust-relevant animals (Davey, Forster, & Mayhew, 1993; Klieger & Siejak, 1997) and BII fears (Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000). Furthermore, disgust sensitivity tends to be higher in individuals reporting animal phobias (de Jong, Andrea, & Muris, 1997; Merckelbach, de Jong, Arntz, & Schouten, 1993) and BII phobias (Tolin, Lohr, Sawchuk, & Lee, 1997). For example, treatment-seeking women with spider phobia were found to have higher food-related disgust sensitivity than a control group (Merckelbach, et al., 1993). In another study, Tolin and colleagues (1997) found that animal phobics reported greater disgust sensitivity than controls. Sawchuk, Lohr, Lee, and Tolin (1999) reported that analogue BII phobics responded to a video of maggots and larvae with higher disgust, fear, and anger than did normal controls.

Comparable to Reiss' three fundamental sensitivities, there is evidence that disgust sensitivity is a trait rather than a mood state. The Disgust Scale (Haidt et al., 1994) demonstrates good test-retest validity across several months (Rozin, Haidt, McCauley,, Dunlop, & Ashmore 1999). In addition, although several domains of disgust have been identified (e.g., body product, animal, hygiene), disgust sensitivity appears to be best described as a non-reducible construct (Haidt, 2002; Haidt et al., 1994). Also, disgust sensitivity appears to have a moderate familiality, in that parent and child reports of disgust sensitivity are moderately and positively correlated (Davey, et al., 1993; Rozen et al., 1984). In one interesting study, Davey and colleagues found that parental food-related disgust sensitivity, but not parental fear of spiders, predicted the fear of spiders in offspring (cf. de Jong et al., 1997).

From the preceding review there is good evidence that disgust sensitivity is a trait construct that has an established relationship with fears and phobias. However, apparently no systematic attempt has been made to test whether disgust sensitivity explains variance in the experience of common fears beyond that attributed to Reiss's (1991) three fundamental sensitivities. Therefore, the current study will expand on expectancy theory by including disgust sensitivity as a fear-relevant sensitivity and concerns of contamination as the associated expectancy.

The choice of "contamination" rather than "disgust" as the matching expectancy deserves comment. In developing the expectancy questionnaire for this study, it was important to consider that an "expectancy" concerns the likelihood of an occurrence (i.e., unlikely to very likely). For example, asking the likelihood of being injured or having a panic attack provides a fairly clear picture of the target outcome. On the other hand, the emotion of disgust is likely to be experienced to some degree when any disgust-relevant stimulus is present (e.g., cockroach, dog feces). Therefore, respondents might be expected to rate the likelihood of disgust occurring to be high, although it is less clear to what degree the respondent finds that outcome to be aversive. The prominent evolutionary perspective on disgust is that experiencing this emotion warns us of things that may contaminate us or make us ill (Woody & Teachman, 2000). Therefore, an individual's expectation of the likelihood of "becoming contaminated or ill" through contact with a particular stimulus would be expected to relate to fear and avoidance of that stimulus. Consequently, it might be expected that fear of a spider or another disgust-relevant stimulus would be potentiated for individuals who believed that the chances of becoming contaminated were likely and also experienced high levels of disgust sensitivity.

Experiment 1

Aims and Implications

Reiss's expectancy theory has been considerably influential, especially in regard to anxiety sensitivity, and has important implications concerning our understanding of the acquisition and maintenance of fears. As reviewed above, although the few studies that have tested expectancy theory have not provided much empirical support, they also demonstrate significant methodological limitations. Therefore, a primary aim of this study is to test Reiss' expectancy theory (Reiss, 1991) using revised measures and improved methodology. Another primary aim is to examine the role of disgust sensitivity and contamination expectancies in predicting fearfulness in the context of expectancy theory. A secondary, but no less important aim of this study is to develop a useful measure of outcome expectancies.

There are several implications of this study for our understanding of fear. First, this study will examine the ability of several psychological vulnerabilities and fear-relevant cognitions to predict individual differences in common fears. Identifying mechanisms by which fears can arise and be maintained is important in prevention and treatment of phobias. For example, treatments specifically targeting an individual's expectancies during exposure therapy may improve outcomes (Reiss & McNally, 1985).

In addition, results may elucidate common mechanisms by which related clinical phenomena present, and therefore instruct the development psychopathology nosology. This study will also have several potential implications, such as the development of a novel measure of expectancies that may prove useful in future studies and in clinical work. In addition, results will provide psychometric data for several recently revised measures, such as the 11-item Anxiety Sensitivity Index (Blais, et al., 2001). Finally, this study will attempt to clarify just what expected outcomes individuals associate with feared situations or objects.

Summary of Analytic Methods

Reiss' moderation model of expectancy theory is tested by a series of hierarchical regression analyses (one per fear subtype). In brief, main effects are entered in earlier steps with interaction terms entered into a later step. If the inclusion of the step retaining the interaction terms significantly improves the amount of variance accounted for in the dependent variable, *post hoc* analyses are conducted to examine the nature of the interaction (i.e., moderation). In this study, the dependent variable is the specific fear that is being predicted. The five interaction terms are created by multiplying each sensitivity by its associated expectancy. To examine whether disgust sensitivity and contamination expectancies predict variance in fears beyond that predicted by the other sensitivities and expectancies, they are entered together in a subsequent and separate step. Variables will be entered into the regression in this order: Step 1 (sex as a covariate, based on preliminary analyses presented below); Step 2 (sensitivities sans disgust sensitivity); Step 3 (outcome expectancies pertaining to the fear in question); Step 4 (disgust sensitivity and contamination expectancy); and Step 5 (five interaction terms). An illustration of the moderation model is presented in Figure 2.

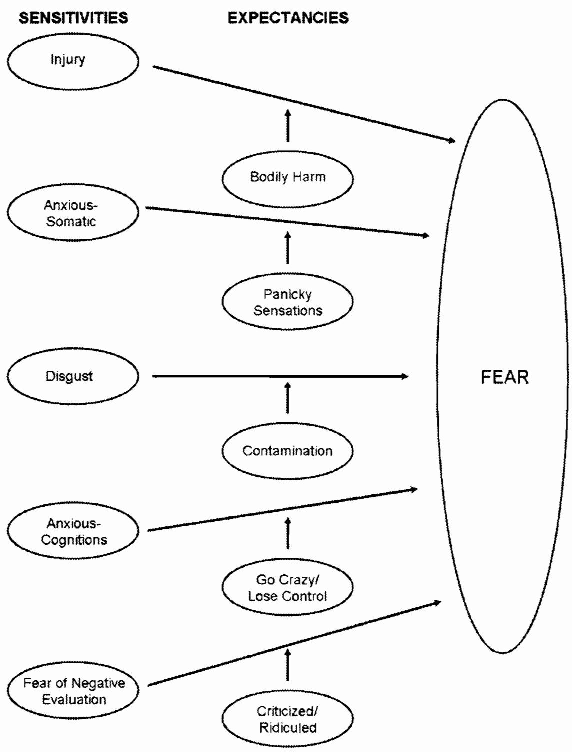

Figure 2. Tested moderation model of expectancy theory. This model can be contrasted with Reiss' moderation model, as illustrated in Figure 1. Note that disgust sensitivity and contamination expectancy were not included in Reiss' original expectancy theory.

Consistent with the strategy adopted by Taylor (1993), the current study uses subscales from a modified Fear Survey Schedule-III (Wolpe & Lang, 1964) as dependent variables. The several versions of the Fear Survey Schedule (Arrindell, 1980; Geer, 1963; Lang & Lazovick, 1963; Wolpe & Lang, 1964) have been popular research tools and clinical assessment instruments for over four decades. The more than 40 evaluations of the factor structure of the FSS-III and its predecessors have typically suggested that most fears can be classified into one of four factors: blood/injury/injection fears, social fears, animal fears, and situational (or "agoraphobic") fears (Arrindell, Pickersgill, Merckelbach, Ardon, & Cornet, 1991). The dimensionality of fear questionnaires have appeared generally invariant across gender, nationality and clinical and student samples (e.g., Arrindell et al., 2003), suggesting common determinants underlying factor item covariance (Cattell, 1978). These factors are similar to the phobic categories outlined in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994), demarcated by associated features such as age of onset, gender prevalence, and physiological markers (see review in Craske et al., 1996).

In preparation for Experiment 1, a confirmatory factor analysis (CFA) was conducted to evaluate a modified FSS-III that was hypothesized to contain four fear subtypes: animal fears, BII fears, claustrophobic fears, and social fears. Claustrophobia, a component of the more broadly-inclusive and relatively less-stable situational factor (Arrindell, et al., 1991; Taylor, 1998) was used in this study in order to improve precision of construct measurement. As anticipated, the CFA supported a four factor structure for the modified FSS-III that included animal fears, BII fears, claustrophobic fears, and social fears. Analytic methods and results of the CFA are presented in Appendix C.

Hypotheses

1. The interaction between sensitivities and expectancies will predict four common fear subtypes (animals, BII, claustrophobic, social) better than sensitivities and expectancies alone.

2. The addition of disgust sensitivity and expectancies of contamination to Reiss' moderation model of expectancy theory will significantly improve the prediction of fears.
3. Based on prior findings (reviewed above), several specific predictions can be made regarding the ability of sensitivities and expectancies to predict fears:
    a. *Animal fears* will be predicted by fear of negative evaluation, injury sensitivity, disgust sensitivity, and expectancies of injury and contamination.
    b. *BII fears* will be predicted by injury sensitivity, disgust sensitivity, and expectancies of panic and contamination.
    c. *Claustrophobic fears* will be predicted by anxiety sensitivity (both somatic and cognitive aspects) and expectations of physical injury and panic.
    d. *Social fears* will be predicted by fear of negative evaluation and expectancies of ridicule, criticism, or embarrassment.

Method

Participants

Participants were 445 undergraduate students attending a large, urban, state university in Virginia, U.S.A. and receiving class credit for participation. Five cases were removed from the analyses due to incomplete response forms resulting in the complete loss of one or more measures. An additional fifteen cases were removed due to patterns of missing data (i.e., inspection of the computer optical scan-type record forms revealed that a participant missed or skipped items resulting in an indeterminate number of consecutively misplaced responses). Of the remaining 425 students, 62% were female, 37% male, and 1% unknown. The majority of participants were first year students (67%; second year = 18%; third year = 11%; beyond third year = 3%; unknown <1%). About half the students self-identified as White/Caucasian (53%), about a quarter self-identified as Black/African-American (28%), and North Asian (7%), Hispanic (3%), Pacific Islanders (3%), "Other" (5%), and unidentified individuals (<1%) comprised the remaining sample. About 90% of participants were between 18-21 years of age with a mean age of 19.7 years.

Measures

The questionnaire packet included a demographic form (age, race, sex, and year in school), a survey of common fears, a questionnaire about the foci of apprehension concerning common fears, a questionnaire of disgust sensitivity, a measure of anxiety sensitivity, a measure of injury sensitivity, and a measure of fear of negative evaluation.

1. *Demographic form.* This includes a query of age, race, gender, and year in school. (Appendix D)

2. *Fear Survey Schedule-III* (FSS-III; Wolpe & Lang, 1964). The 52-item FSS-III is a popular measure of fearfulness. Two additional animal ("sharks" and "bears"), one claustrophobic ("long tunnels"), and one social situational items ("Eating in a cafeteria by myself") were included bringing the total count to 56 items for exploratory analyses. Instructions state, "The items in this questionnaire refer to things and experiences that may cause fear or other unpleasant feelings. Rate each item for how much you are disturbed by it nowadays." Responses are recorded on a 5-point Likert-type scale ("not at all" to "very much"). (Appendix C1)

3. *Focus of Apprehension Survey Schedule* (FASS). This measure asks respondents to rate the likelihood of five possible outcomes (i.e., "expectancies") when confronted with sixteen commonly-feared stimuli or situations on a 5-point Likert-type scale ("not likely" to "very likely"). The five expectancies included in this measure encompass the majority of feared outcomes reported by patients receiving treatment for specific phobias (Lipsitz et al., 2002): receiving a physical injury, experiencing panicky bodily sensations, becoming contaminated or becoming ill in some way, losing mental control or going crazy, and being ridiculed, criticized, or judged by others. This measure was specifically developed for this study. (Appendix E)

4. *Disgust Scale, Version 2* (DS2; Haidt, et al., 2002). The 32-item DS2 was developed as an improvement to the Disgust Scale (DS; Haidt, et al., 1994), a popular measure of disgust sensitivity. The DS2 taps several disgust-relevant domains including core disgust (e.g., food, animals, and body products), death/envelope violations, interpersonal, and sex and predicts disgust-related behaviors as well as the original DS scale (Haidt, 2004). Two 16-item instruction and response sets are used with 4-point Likert-type rating scales. The first asks respondents to rate how much they agree with various items (e.g., "If I see someone vomit, it makes me sick to my stomach.") whereas the second asks how disgusting the respondents find various experiences (e.g., "While walking under a railroad track, you smell urine.").

One of the limitations of the DS and DS2 for the current study is that responses on several items may be potentiated by animal fears (e.g., "Seeing a cockroach in someone else's house does [not] bother me.") and blood/injection/injury fears (e.g., "You see a man's intestines exposed after an accident.") resulting in an artificially inflated correlation between the DS2 and fear scales. To minimize this effect, a 20-item modified DS2 was constructed for this study that excluded items mentioning animals or mutilation-related stimuli. The 20-item scale demonstrated good internal consistency (Cronbach's alpha = .85) as did the 32-item scale (Cronbach's alpha = .89), and the two scales were highly correlated, $r = .96$. Furthermore, compared to the full 32-item DS2, the 20-item DS2 had smaller correlations with BII (.28 vs. .41) and animal fears (.40

vs. .47) while retaining a very similar correlation with claustrophobic (.22 vs. .24) and social fears (.19 vs. .20). Therefore, the removal of items from the DS2 that overlap with FSS items appears to reduce the inflation of correlations with disgust-relevant fear subtypes while preserving correlations with non-disgust-relevant fear subtypes and the scale's internal consistency. This 20-item disgust scale will be used in all analyses. (Appendix F)

5. *Anxiety Sensitivity Index* (ASI; Reiss, et al., 1986). This 16-item self-report measure taps beliefs about the dangerousness of anxiety-related symptoms. Respondents rate agreement with statements on a 5-point Likert-type scale ("very little" to "very much"). The 11-item ASI (Bais et al., 2001) used in this study is derived from the 16-item ASI. Two subscales were used for this study: sensitivity to physical symptoms of anxiety (ASI-PHY; items 3, 4, 6, 9, 10, 14) and sensitivity to anxiety-related cognitions (ASI-COG; items 2, 11, 12, 15, 16). The internal consistency of the 11-item ASI in this sample was good (Cronbach's alpha = .82). (Appendix A1)

6. *Injury Sensitivity Index* (ISI; Taylor, 1993). The ISI is an eleven-item measure pertaining to fears of illness and injury. Respondents rate agreement with statements on a 5-point Likert-type scale ("very little" to "very much"). The internal consistency in this sample was good (Cronbach's alpha = .91). (Appendix G)

7. *Brief Fear of Negative Evaluation Scale-S* (BFNE; Rodebaugh et al., 2004). The BFNE is a 12-item measure of apprehension about being evaluated

negatively (Leary, 1983), based on the original 30-item FNE (Watson & Friend, 1969). The BFNE has adequate test-retest reliability and internal consistency (Leary, 1983) and is preferable for the measure of negative evaluation fears over the original scale (Rodebaugh et al., 2004). Rodebaugh and colleagues (2004) reported that a BFNE subscale consisting of the eight straightforwardly-worded items is more reliable, more discriminating, and more related to measures of social anxiety than the full scale which includes reverse-scored items. Respondents are asked to rate each statement regarding how characteristic it is of the individual completing the questionnaire on a 5-point Likert-type scale ("not at all" to "extremely"). The internal consistency in this sample was good (Cronbach's alpha = .93). (Appendix H)

Procedures

Participants were administered informed consent and asked to complete questionnaire packets in classrooms with up to 20 other students proctored by this author (S.M.) and/or an undergraduate research assistant. They were given the materials and asked to thoroughly read and sign the informed consent before completing the questionnaire packet. The FASS and the sensitivity questionnaires (DS, ASI, ISI, and BFNE) were counterbalanced to allow comparison of order effects. Answers were placed on a computer optical scan-type record sheet that included a subject number and the demographic information mentioned above. Administration time ranged from about 30 to 55 minutes. After completing the questionnaires, participants were thanked for their time and were provided a debriefing fact sheet concerning the purpose of the study.

Results

First, preliminary analyses were conducted which include: an examination of missing data; construction of variables and examination of distributional characteristics; effects of counterbalancing, bivariate Pearson correlations, means and standard deviations for study variables, and effects of demographic variables. Second, the moderation model of expectancy theory was tested using hierarchical regression analyses.

Preliminary Analyses

Missing Data. For the 425 participants, fifteen missing data points were observed for study variables out of a total 36,550 data points (0.041%; excluding demographic data, reviewed below). Missing data was replaced using the person mean substitution method, which replaces the missing data point with the mean of the other items in that scale per individual (Downey & King, 1998). This method reflects individual differences in responding and benefits from correlations between scale items (McDonald, Thurston, & Nelson, 2000).

Construction, Distributional Characteristics, and Transformations of Variables. The sensitivity measures (ISI, ASI-PHY, ASI-COG, BFNE, DS2) and the FSS-III subscales (animal, BII, claustrophobia, and social) were computed by summing scale items after applying item weights based on factor score coefficients (Grice & Harris, 1998). Weighting items based on factor score coefficients results in a measure that better reflects the relative spacing of individuals on the measure's underlying factor (Grice, 2001). For each measure, items were subject to a principal components analysis and the component score coefficients were used as item weights. The FASS items were weighted by the coefficients of their associated FSS-III items. For example, the weight for the animal fear item "snakes" would be applied to the five FASS items associated with expectancies of snakes.

Outliers, skewness, and kurtosis were examined using SPSS 13.0.1 Descriptives, Frequencies, and histograms (SPSS Inc., Chicago IL). For sensitivities and fear subscales, no significant outliers were detected and kurtosis was within acceptable limits considering the sample size (Tabachnick & Fidell, 2001). A mild to severe positive skew was found for the four fear subscales and for the sensitivity measures other than DS2. Conventional transformations were successful in reducing skewness to acceptable levels for each of the variables (Tabachnick & Fidell, 2001). The transformations applied were as follows: square root (animal and social fears), logarithmic (BFNE, ASI-PHY, ISI and BII fears), and inverse (ASI-COG and claustrophobia). Mild to severe positive skew was also found across FASS variables. In many cases, a low rate of endorsement would be expected by theory (and common sense), such as the case of expectancies of contamination due to public speaking. Transformations were successful in reducing skewness primarily for FASS variables in which a wide range of individual differences were expected: square root (social fear expectancies of panic and of being criticized), logarithmic (claustrophobic and animal fear expectancies of panic; animal expectancies of physical injury), and inverse (BII fear expectancies of panic and contamination).

Linearity and homoscedasticity were judged to be acceptable through evaluation of scatterplots for sensitivities and fears. The Mahalanobis distance was employed at a conservative alpha (0.001; Tabachnick & Fidell, 2001) to screen for multivariate outliers. None were identified.

Effects of Counterbalancing. Participants were equally distributed into the two packet conditions by ethnic groups (Pearson $\chi^2(7) = 7.64$, *ns*), sex (Pearson $\chi^2(2) = 0.41$, *ns*), and year in school (Pearson $\chi^2(5) = 1.74$, *ns*). Independent samples *t*-tests with Bonferroni correction for multiple comparisons revealed that scores on sensitivity, expectancy and fear measures were equivalent across the two packet conditions.

Descriptive Statistics and Correlations. Table 1 shows means and standard deviations for study variables in their original metrics, whereas Appendix I provides values for these variables after appropriate weighting and transformations. A secondary aim of this study was to develop a measure of expectancies that could be used to test expectancy theory. Table 2 provides mean and median expectancy ratings for individuals reporting being "very disturbed" (i.e., a maximum rating of "5" on the FSS-III item) by four common fear stimuli: public speaking, snakes, being injected, and enclosed spaces. Similar to results of the pilot study described above (and in Appendix B) ratings of expectancies varied by fear stimulus. For example, as might be expected, individuals who found the idea of speaking in public disturbing expected to experience panic and a potentially embarrassing outcome. A point of contrast between the results of these two studies regards the effect of changing the "expectancy of disgust or revulsion" in the pilot study to "expectancy of contamination." Consistent with expectations, individuals tended to rate "expectancies of contamination" less likely than they did "expectancies of disgust" in the pilot study, across fear subtypes. Still, ratings on this variable tended to discriminate between snake and injection fears on one hand, and speech and claustrophobic fears on the other.

Table 1
Means and Standard Deviations of Study Variables (N = 425)

Variables	*M*	*SD*
Fear Subtypes		
Animal Fears	2.25	.95
BII Fears	2.07	.86
Claustrophobic Fears	1.73	.78
Social Fears	2.40	.79
Sensitivities		
Injury Sensitivity Index	2.50	.87
ASI-Physical Symptoms	2.30	.80
Disgust Scale-2	2.36	.53
ASI- Anxiety-Related Cognitions	1.61	.64
Brief Fear of Negative Evaluation Scale	2.71	1.05
Expectancies		
Animal Fears		
Expectancies of physical injury	1.45	.60
Expectancies of panic	2.10	.90
Expectancies of contamination	1.36	.60
Expectancies of losing mental control	1.33	.61
Expectancies of being criticized	1.29	.54
BII Fears		
Expectancies of physical injury	1.10	.30
Expectancies of panic	1.95	.85
Expectancies of contamination	1.43	.65
Expectancies of losing mental control	1.19	.52
Expectancies of being criticized	1.14	.40
Claustrophobic Fears		
Expectancies of physical injury	1.17	.41
Expectancies of panic	1.76	.73
Expectancies of contamination	1.14	.35
Expectancies of losing mental control	1.28	.49
Expectancies of being criticized	1.14	.35
Social Fears		

Expectancies of physical injury	1.04	.18
Expectancies of panic	2.35	.82
Expectancies of contamination	1.13	.33
Expectancies of losing mental control	1.23	.45
Expectancies of being criticized	2.37	1.05

Note. ASI = "Anxiety Sensitivity Index."

Table 2
Mean Expectancy Ratings by Select Fears.

	Public Speaking		Snakes		Injections		Enclosed Spaces	
Expectancy	*M*	*Md*	*M*	*Md*	*M*	*Md*	*M*	*Md*
Be physically injured	1.0	1.0	2.7	3.0	3.2	3.0	2.3	1.0
Experience panicky bodily sensations	4.6	5.0	4.2	5.0	4.3	5.0	4.4	5.0
Become contaminated or ill in some way	1.7	1.0	2.2	2.0	2.5	2.0	1.6	1.0
Lose mental control or "go crazy"	2.1	1.0	2.4	2.0	1.9	1.0	3.1	3.0
Being, ridiculed, criticized or judged	4.0	5.0	2.2	1.0	2.0	1.0	1.6	1.0
N	51		52		33		14	

Note. Range of scores is 1 (low) to 5 (high). *Md* = median.

Bivariate Pearson correlations are shown in Tables 3 through 6. Table 3 shows the correlations between sensitivities and fear subtypes. Table 4 shows the correlations between expectancies and fears, Table 5 shows the correlations between expectancies and sensitivities, and Table 6 shows the correlations between expectancies per fear subtype.

A few general comments can be made regarding the correlations. First, certain trends are evident that appear to support hypotheses. For example, in Table 3, correlations for the Disgust Scale-2 are highest with Animal and BII fears. Also, the

Brief Fear of Negative Evaluation scale correlates most strongly with social fears. Another trend is that expectancies tend to correlate highest with the fears they are expected to be associated with. For example, in Table 4, the five expectancies associated with animal fears are correlated most strongly with animal fears (as opposed to the other three fear subtypes). On the other hand, most of the study variable intercorrelations are significant, perhaps reflecting a general response bias or indication of power rather than a practical illustration of relationships. Indeed, one of the essential characteristics of this experiment is the ability to examine the unique variance that individual variables account for in fearfulness after removing the variance shared with other predictors. For example, it is hypothesized that expectancies of ridicule, criticism, or embarrassment will be a particularly robust predictor of social fears (Hypothesis 3d). Although bivariate correlations suggest that several expectancies are associated with social fears, perhaps only the semi-partial correlation between expectancy of criticism and social fear will be significant after removing shared variance associated with other expectancies. For that reason, the regression strategy that will be used to test the moderation model of expectancy theory (described below) is expected to highlight relationships between sensitivities, expectancies, and fears.

Table 3

Bivariate Pearson Correlations for Sensitivities and Fear Subtypes (N=425)

Variable	2	3	4	5	6	7	8	9
1. Animal Fears	.34**	.30**	.18**	.29**	.30**	.40**	.09	.01
2. BII Fears	--	.22**	.25**	.26**	.32**	.29**	.13**	.12*
3. Claustrophobic Fears		--	.23**	.26**	.33**	.22**	.16**	.09
4. Social Fears			--	.19**	.29**	.19**	.27**	.40**
5. Injury Sensitivity Index				--	.45**	.32**	.36**	.33**
6. ASI-Physical Symptoms					--	.30**	.44**	.24**
7. Disgust Scale-2						--	.20**	.07
8. ASI- Anxiety-Related Cognitions							--	.33**
9. Brief Fear of Negative Evaluation Scale								--

Note. ASI = "Anxiety Sensitivity Index." Variables 1-4 are fear subtypes, and variables 5-9 are sensitivities.

* $p < .05$. ** $p < .01$.

Table 4

Correlations between Expectancies and Fear Subtypes (N=425)

Expectancies	Animal	BII	Claustrophobic	Social
Animal Fears				
Physical injury	.47**	.16**	.28**	.16**
Panic	.68**	.20**	.31**	.23**
Contamination	.41**	.17**	.25**	.16**
Lose mental control	.46**	.17**	.24**	.17**
Being criticized	.43**	.14**	.15**	.08
BII Fears				
Physical injury	.13**	.15**	.07	-.02
Panic	.32**	.68**	.20**	.23**
Contamination	.24**	.37**	.22**	.21**
Lose mental control	.17**	.31**	.14**	.10*
Being criticized	.15**	.24**	.10*	.09
Claustrophobia				
Physical injury	.29**	.15**	.32**	.14**
Panic	.32**	.22**	.69**	.28**
Contamination	.23**	.16**	.34**	.05
Lose mental control	.20**	.20**	.45**	.16**
Being criticized	.19**	.07	.30**	.09
Social Fears				
Physical injury	.11*	.04	.09	.01
Panic	.18**	.14**	.16**	.64**
Contamination	.09	.10*	.08	.24**
Lose mental control	.12*	.14**	.17**	.36**
Being criticized	.14**	.17**	.18**	.44**

* $p < .05$. ** $p < .01$.

Table 5

Correlations between Expectancies and Sensitivities (N=425)

Expectancies	ISI	ASI-PHY	DS2	ASI-COG	BFNE
Animal Fears					
Physical injury	.30**	.28**	.28**	.18**	.08
Panic	.32**	.36**	.33**	.15**	.07
Contamination	.31**	.29**	.29**	.21**	.09
Lose mental control	.29**	.30**	.30**	.20**	.08
Being criticized	.20**	.17**	.24**	.10*	.01
BII Fears					
Physical injury	.06	.14**	.03	.10*	< .01
Panic	.26**	.36**	.31**	.23**	.18**
Contamination	.22**	.30**	.19**	.24**	.13**
Lose mental control	.14**	.20**	.10*	.21**	.10*
Being criticized	.11*	.18**	.10*	.15**	.09
Claustrophobia					
Physical injury	.22**	.24**	.08	.14**	.15**
Panic	.24**	.37**	.21**	.21**	.21**
Contamination	.10*	.20**	.06	.21**	.06
Lose mental control	.20**	.29**	.16**	.30**	.12*
Being criticized	.21**	.18**	.13**	.21**	.12*
Social Fears					
Physical injury	.11*	.13**	.10*	.08	.06
Panic	.25**	.28**	.16**	.31**	.43**
Contamination	.13**	.15**	.02	.28**	.17**
Lose mental control	.20**	.20**	.09	.33**	.24**
Being criticized	.26**	.17**	.09	.25**	.36**

Note. ISI = Injury Sensitivity Index; ASI-PHY = ASI-Physical Symptoms; DS2 = Disgust Scale-2; ASI-COG = ASI- Anxiety-Related Cognitions; BFNE = Brief Fear of Negative Evaluation Scale.

* $p < .05$. ** $p < .01$.

Table 6

Correlations between Expectancies per Fear Subtype (N=425)

Expectancies	Panic	Contamination	Lose mental control	Being Criticized
		Animal Fears		
Physical injury	.55**	.69**	.60**	.39**
Panic	--	.46**	.51**	.42**
Contamination		--	.63**	.50**
Lose mental control			--	.65**
Being criticized				--
		BII Fears		
Physical injury	.34**	.46**	.65**	.61**
Panic	--	.51**	.55**	.47**
Contamination		--	.61**	.47**
Lose mental control			--	.70**
Being criticized				--
		Claustrophobia		
Physical injury	.47**	.54**	.42**	.41**
Panic	--	.48**	.57**	.39**
Contamination		--	.53**	.49**
Lose mental control			--	.47**
Being criticized				--
		Social Fears		
Physical injury	.12*	.25**	.24**	.02
Panic	--	.35**	.45**	.51**
Contamination		--	.50**	.22**
Lose mental control			--	.39**
Being criticized				--

* $p < .05$. ** $p < .01$.

Effects of Demographic Variables. Reiss' expectancy theory does not instruct on whether the relationship between sensitivities, expectancies, and fears are moderated by variables such as sex, race, or age. However, studies have consistently reported that women tend to score higher on fear questionnaires (Arrindell et al., 2003), DS (Haidt, et al., 1994) and the ASI (Peterson & Plehn, 1999). Based on this trend, exploratory examinations of group differences for sex and race were conducted. First, the effect of sex on the study variables was assessed. Consistent with these findings, independent samples *t*-tests revealed that females rated the sensitivities and fears significantly higher than men, with the exception of BFNE, which was similar for females and males (Table 7). When the Bonferroni correction for multiple comparisons was employed, women's ratings were still significantly higher on all but BFNE, ASI-COG, and BII fears. Women also reported significantly greater expectancies of panicky bodily sensations related to animals, claustrophobic situations, and social situations with a tendency ($p < .10$) to hold these expectancies related to BII stimuli (Table8). Women also reported significantly greater expectancies of ridicule or criticism in relation to social situations. Women also tended ($p < .10$) to have greater expectancies of physical injury related to animals and expectancies of losing mental control related to BII stimuli. However, with a conservative alpha level determined by Bonferroni correction, only the expectancy to panic relative to animals and claustrophobic situations was significantly greater in women.

Due to the sex differences in ratings, there was concern that sex may also influence the correlations between variables. Therefore, bivariate Pearson correlations between variables for men and women were computed separately and compared using a *z*-score significance test (Ferguson & Takane, 1989) with Bonferroni correction. Several significant differences between correlations were observed by sex (most notably, BFNE was significantly and positively correlated with BII fears (0.39) and animal fears (0.36) for men, but not for women (0.08 and -0.05, respectively)). Due to these findings, a variable for sex was entered as a covariate in analyses of the mediation and moderation models.

Table 7
Means and Standard Deviations of Sensitivities and Fear Subtypes by Sex (158 males, 262 females)

Variable	Males *M*	Males *SD*	Females *M*	Females *SD*	*T*-Test[a]
Injury Sensitivity Index	2.30	.84	2.61	.86	F > M**
ASI-Physical Symptoms	2.09	.69	2.42	.84	F > M**
Disgust Scale-2	2.20	.50	2.47	.52	F > M**
ASI- Anxiety-Related Cognitions	1.67	.61	1.58	.66	M > F*
Brief Fear of Negative Evaluation Scale	2.67	.61	2.73	1.11	
Animal Fears	1.89	.82	2.46	.96	F > M**
BII Fears	1.90	.75	2.17	.91	F > M**
Claustrophobia	1.50	.58	1.87	.85	F > M**
Social Fears	2.20	.71	2.52	.82	F > M**

Note. Values represent weighted and (where appropriate) transformed measures. ASI = "Anxiety Sensitivity Index."
[a]Independent samples *t*-tests.
* $p < .05$. ** $p < .01$.

Table 8
Means and Standard Deviations of Expectancies per Fear Subtype by Sex (158 males, 262 females)

	Males		Females		
Variable	*M*	*SD*	*M*	*SD*	*T*-Test[a]
Animal Fears					
physical injury	1.37	.52	1.49	.64	F > M†
panic	1.80	.75	2.28	.94	F > M**
contamination	1.35	.59	1.36	.61	
lose mental control	1.27	.54	1.37	.64	
being criticized	1.25	.45	1.31	.58	
BII Fears					
physical injury	1.13	.35	1.08	.26	
panic	1.83	.81	2.02	.87	F > M†
contamination	1.40	.65	1.45	.65	
lose mental control	1.23	.56	1.17	.50	M > F†
being criticized	1.15	.42	1.13	.39	
Claustrophobic Fears					
physical injury	1.16	.38	1.18	.42	
panic	1.54	.58	1.88	.77	
contamination	1.14	.33	1.14	.36	
lose mental control	1.29	.48	1.28	.49	F > M**
being criticized	1.14	.36	1.14	.34	
Social Fears					
physical injury	1.05	.18	1.04	.16	
panic	2.18	.73	2.45	.86	F > M**
contamination	1.14	.32	1.12	.33	
lose mental control	1.22	.44	1.23	.46	
being criticized	2.20	1.00	2.47	1.08	F > M*

Note. Values represent weighted and (where appropriate) transformed measures.
[a]Independent samples *t*-tests.
$^{\dagger}p < .10$. * $p < .05$. ** $p < .01$.

Next, the effect of race on sensitivities, expectancies and fear subtypes was assessed. The literature provides little guidance on possible effects of race on the variables of interest and generally stresses the similarities between ethnic groups and nationalities on the dimensional constancy of these measures (Arrindell et al., 2003; Bernstein et al., 2006). However, one study found that Asians and Blacks scored significantly higher than Whites on the Disgust Scale (Haidt et al., 1994). Means and standard deviations per race are provided in Table 9 and 10.

Two multiple analysis of covariance (MANCOVA) were conducted. The first included sensitivities (injury, anxiety-related physical sensations, disgust, anxiety-related cognitions, negative evaluation) and fears (animal, BII, claustrophobia, social) and the second used expectancies (one set of five expectancies per fear: physical injury, panic, contamination, lose mental control, being criticized) as dependent variables (DVs). For each analysis, gender was used as a covariate and race was entered as the independent variable. Analyses were restricted to North Asian, Hispanic, White, Black, and Pacific Islander groups due to the small number of Native Americans in this sample and the ambiguity posed by those marking "other." Further, it is noted that mean differences between groups should be interpreted with caution, due to the relatively small number of North Asian (n = 28), Hispanic (n = 13) and Pacific Islander (n = 14) participants in these analyses.

For the first MANCOVA (sensitivities and fear subtypes as DVs), the omnibus significance test revealed differences by race, Wilks' Lambda = .750, F (36, 1430) = 3.16, p < .001, partial eta^2 = .07. Ratings varied by race on three variables: DS (F (4, 389) = 12.98, p < .001, partial eta^2 = .12), animal fears (F (4, 389) = 4.39, p < .01, partial eta^2 = .04), and social fears (F (4, 389) = 3.22, p <.05, partial eta^2 = .03). Paired comparisons revealed that Whites reported significantly less disgust sensitivity than North Asians, Hispanics, and Blacks. In addition, Pacific Islanders scored significantly higher than North Asians. For animal fears, Whites reported significantly lower fears than Blacks. Conversely, for social fears, Whites reported significantly higher social fears than North Asians, Hispanics, and Blacks.

For the second MANCOVA (expectancies), racial group differences were also observed for expectancy measures, Wilks' Lambda = .722, F (80, 1462) = 1.57, p =<.001, partial eta² = .08. Ratings varied by race on expectancies of physical injury related to social fears (F (4,389) = 3.326, $p < .05$, partial eta² = .03) and each of the expectancies related to animal fears (F (4,389) = 3.88 - 8.10, $p < .05$ for each variable, partial eta² = .04 - .08). Paired comparisons revealed that Hispanics reported significantly greater expectations of physical injury in social situations than North Asians, Whites, and Blacks. Furthermore, Blacks reported significantly higher expectancies of physical injury than Whites. There were several differences between racial groups on expectancies related to animal fears. Hispanics and Blacks reported significantly higher expectancies of physical injury than Whites. Blacks reported significantly higher expectancies of panic than Whites and Pacific Islanders. Hispanics reported significantly higher expectancies of contamination than North Asians, Whites, and Pacific Islanders, and Blacks reported significantly higher expectancies of panic than Whites. Blacks reported significantly higher expectations of losing mental control than North Asians, Hispanics, and Whites. Finally, Blacks reported significantly higher expectations of being ridiculed or criticized than North Asians, Hispanics, and Whites.

Bivariate Pearson correlations between variables per racial group were compared as described for sex above. Due to the overwhelming number of possible combinations of variables and racial groups, a sample of fourteen correlations were examined for the two largest racial groups in this sample, Whites and Blacks, that demonstrated racial differences in the analyses above (animal fears, social fears, DS, and related expectancies). The groups significantly differed only on the strength of the correlation between animal fears and the expectancies of panic related to animal fears. The correlation was significantly stronger for Whites (0.72) than for Blacks (0.56). Although mean racial group differences were found on study measures, those differences tended to be small (only one eta^2 value greater than .08) there appear to be marginal if any substantial differences in correlations between those measures per racial group. Considering the marginal influence of race and considerable reduction in power should racial group be included as a covariate (an additional estimated 120-240 participants, primarily drawn from groups that comprise a small proportion of the university's undergraduates, would be necessary to test the mediation model in Experiment 2), subsequent analyses did not include race as a covariate.

Table 9
Means and Standard Deviations of Sensitivities and Fear Subtypes by Race

Variable	North Asian	Hispanic	White	Black	Pacific Islander
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Injury Sensitivity Index	2.41 (.64)	2.73 (.91)	2.38 (.81)	2.68 (.99)	2.64 (1.09)
ASI-Physical Symptoms	2.32 (.81)	2.32 (.69)	2.24 (.79)	2.46 (.85)	2.20 (.84)
Disgust Scale-2	2.71 (.39)	2.71 (.53)	2.21 (.50)	2.54 (.49)	2.38 (.53)
ASI- Anxiety-Related Cognitions	1.67 (.53)	1.56 (.43)	1.57 (.63)	1.64 (.67)	1.60 (.88)
Brief Fear of Negative Evaluation Scale	2.88 (.88)	2.71 (1.05)	2.78 (1.02)	2.53 (1.12)	2.69 (1.15)
Animal Fears	2.31 (1.05)	2.26 (.68)	2.07 (.84)	2.58 (1.05)	2.07 (1.04)
BII Fears	2.04 (.66)	2.08 (1.07)	2.09 (.90)	2.12 (.84)	1.73 (.81)
Claustrophobia	1.52 (.57)	1.46 (.50)	1.78 (.85)	1.72 (.69)	1.79 (1.05)
Social Fears	2.18 (.75)	2.15 (.79)	2.50 (.77)	2.34 (.82)	2.12 (.78)
N	28	13	227	118	14

Note. ASI = "Anxiety Sensitivity Index."

Table 10

Means and Standard Deviations of Expectancies per Fear Subtype by Race

Variable	North Asian *M (SD)*	Hispanic *M (SD)*	White *M (SD)*	Black *M (SD)*	Pacific Islander *M (SD)*
Animal Fears					
physical injury	1.42 (.49)	1.67 (.53)	1.35 (.53)	1.62 (.74)	1.33 (.35)
panic	2.19 (1.00)	2.36 (1.11)	1.91 (.81)	2.43 (.94)	1.79 (.70)
contamination	1.29 (.49)	1.74 (.82)	1.25 (.49)	1.53 (.75)	1.31 (.38)
lose mental control	1.26 (.53)	1.23 (.57)	1.21 (.45)	1.60 (.82)	1.26 (.42)
being criticized	1.20 (.46)	1.18 (.35)	1.19 (.40)	1.51 (.73)	1.26 (.42)
BII Fears					
physical injury	1.15 (.34)	1.15 (.43)	1.08 (.26)	1.14 (.34)	1.14 (.29)
panic	2.05 (.79)	2.21 (1.11)	1.96 (.87)	1.96 (.83)	1.45 (.48)
contamination	1.46 (.67)	1.46 (.76)	1.41 (.62)	1.53 (.73)	1.27 (.40)
lose mental control	1.12 (.26)	1.25 (.66)	1.19 (.54)	1.22 (.54)	1.14 (.34)
being criticized	1.05 (.16)	1.17 (.43)	1.12 (.39)	1.16 (.42)	1.21 (.39)
Claustrophobic Fears					
physical injury	1.13 (.28)	1.26 (.41)	1.15 (.35)	1.21 (.52)	1.26 (.47)
panic	1.64 (.60)	1.95 (.71)	1.75 (.74)	1.81 (.78)	1.57 (.63)
contamination	1.14 (.29)	1.21 (.35)	1.12 (.35)	1.15 (.36)	1.26 (.54)
lose mental control	1.19 (.38)	1.44 (.46)	1.26 (.48)	1.32 (.51)	1.36 (.48)
being criticized	1.11 (.45)	1.13 (.22)	1.12 (.30)	1.19 (.40)	1.20 (.41)
Social Fears					
physical injury	1.02 (.09)	1.15 (.32)	1.02 (.13)	1.07 (.22)	1.05 (.12)
panic	2.21 (.73)	2.15 (1.07)	2.39 (.80)	2.39 (.86)	1.98 (.81)
contamination	1.08 (.22)	1.10 (.21)	1.14 (.35)	1.11 (.29)	1.10 (.24)
lose mental control	1.11 (.22)	1.21 (.32)	1.22 (.42)	1.24 (.50)	1.26 (.59)
being criticized	2.08 (.91)	2.44 (1.14)	2.34 (1.02)	2.44 (1.13)	2.62 (1.10)

The third demographic variable examined was age. Participants were categorized into four groups by age: 18 (n = 146), 19 (n = 140), 20 (n = 64), and 21 and above (n = 67). The ages of eight students were unknown and were not included in the analyses. A MANCOVA using sex as a covariate was conducted with the sensitivities and fear subtypes as dependent variables. The omnibus significance test revealed no age differences for the sensitivities and fear subtypes, Wilks' Lambda = .956, F (27, 1181) = .680, p = ns, partial eta² = .02. A separate MANCOVA was conducted using sex as a covariate with the expectancies as dependent variables. The omnibus significant test demonstrated no age differences for the expectancies, Wilks' Lambda = .882, F (60, 1173) = .844, p = ns, partial eta² = .04. Hence, age will not be used as a covariate in subsequent analyses."

Finally, the effect of year in school was examined. Three groups were created: freshmen (n = 285), sophomores (n = 77), and upper classmen (n = 61). Two students whose year in school was unknown were not included in the analysis. A MANCOVA using sex as a covariate found no effect of year in school on sensitivities and fears, Wilks' Lambda = .955, F (18, 812) = 1.055, p = ns, partial eta² = .02. As well, year of school had no effect on expectancies, Wilks' Lambda = .895, F (40, 790) = 1.122, p = ns, partial eta² = .05. Therefore, year in school will not be used as a covariate in subsequent analyses.

Moderation Model of Expectancy Theory

A series of four hierarchical regression analyses were conducted to test the moderation model of expectancy theory using SPSS 13.0.1. The four fear subtypes from the FSS (animal, BII, claustrophobic, and social) were used as dependent variables. Interaction terms were created by multiplying each expectancy measure by its corresponding sensitivity measure after centering the scales of these predictors through z-score standardization (Aiken & West, 1991). For each of the four analyses, five interaction terms were computed (i.e., ISI X expectancies of physical injury, ASI-PHY X expectancies of panic, DS2 X expectancies of contamination, ASI-COG X expectancies of losing mental control, and BFNE X expectancies of being criticized).

Variables were entered into the hierarchical regression analyses in five steps: (1) sex as a covariate; (2) the four sensitivities taken from expectancy theory (ISI, ASI-PHY, ASI-COG, and BFNE); (3) the four expectancy measures associated with the sensitivities in step 1; (4) DS2 and expectancies of contamination; and (5) the five interaction terms. Expectancies of contamination and DS2 were entered as their own step to examine whether they accounted for variance in fears beyond that of Reiss's original expectancies and sensitivities (Hypothesis 2). As well, the five interaction terms were entered into their own step to test the ability of the interaction terms to predict fearfulness beyond the effects of expectancies and sensitivities alone (Hypothesis 1). If the step containing the interaction terms accounts for a significant amount of variance in fears, the regression coefficients for each of the five interaction terms can be examined for significance. Interpretation of such significant coefficients can be accomplished by conducting *post hoc* regressions to determine the nature of the relationship between that interaction term and the fear. Summaries of results of the four regression analyses are presented in Tables M1 to M4 with more detailed data tables presented in Appendix J, Tables J1 through J4.

General comments. Some noteworthy comments regarding the findings are presented to highlight the similarities between the four analyses. First, Steps 1 (sex), 2 (sensitivities) and 3 (expectancies) contributed significantly to regression analyses for each fear (Tables 11 to 14). In addition, for each of the four regression analyses, *R* was significantly different from zero at the end of step 5 (Tables 11 to 14). In other words, the IVs in each analysis, taken as a set, predicted a significant amount of variance in the four fears, accounting for 48% to 53% of the variance. Furthermore, the variable accounting for the largest percentage of unique variance in the four fears was without exception expectancies of panicky bodily sensations (12% to 25%).

Interaction terms. Although main effects for sensitivities and expectancies were found across the four fear subtypes, Step 5, containing the interaction terms, did not significantly improve the prediction of fears beyond the contributions of sex, sensitivities, and expectancies (Hypothesis 1). However, Step 5 approached significance for animal fears ($R^2\Delta = .012$, $p = .055$), with the disgust sensitivity x expectancy of contamination interaction term significant, ($sr^2 = .01$, $\beta = -.06$). The nature of the interaction was examined by halving the sample by mean split of disgust sensitivity and two additional regression analyses were conducted (DS-low, DS-high). Variables were entered into Steps 1-3 as indicated above. Expectancy of contamination was added in Step 4 whereas disgust sensitivity and the interaction term were excluded. Results indicated that the expectancy of contamination predicted a significant additional amount of variance in animal fears for participants relatively low in disgust sensitivity ($R^2\Delta = .01$, $p < .05$; $\beta = .15$, $p < .05$), but did not for participants with higher disgust sensitivity ($R^2\Delta < .01$, *ns*). Scatterplots of expectancy of contamination vs. animal fears with disgust sensitivity identified as "high" and "low" revealed that as the level of disgust sensitivity increased, the expectancy of contamination had less of an effect on animal fears. This finding was counter to the prediction of expectancy theory, which would predict that an increase of disgust sensitivity would potentiate the effect of contamination expectancies on fears. In sum, expectancy theory's assertion that fears can be described by the interaction of sensitivities and expectancies (Hypothesis 1) is not supported in this study.

Disgust sensitivity and expectations of contamination. Step 4, which added disgust sensitivity and expectancies of contamination, contributed a significant amount of variance only for animal ($R^2\Delta = .014, p < .01$) and BII fears ($R^2\Delta = .012, p < .05$) (Hypothesis 2). The individual contributions of the IVs to each fear subtype are discussed below in terms of Step 4 regression coefficients.

Contributors of significant variance in Step 4 for each fear subtype. Predictions concerning the relationships between sensitivities and expectancies with fears are outlined in Hypothesis 3. Hypotheses and results are summarized in Table 15. Four of the IVs contributed significant unique variance in the prediction of animal fears: sex ($sr^2 = .009$), expectancies of panic ($sr^2 = .129$), expectancies of being criticized or embarrassed ($sr^2 = .007$) and DS ($sr^2 = .014$).

For BII fears, expectancies of panic ($sr^2 = .247$), and expectancies of contamination ($sr^2 = .009$) were significant. The regression coefficient for expectancies of physical injury was also significant but negative ($\beta = -.138$, $sr^2 = .010$). Considering that the zero-order correlation between this variable and BII fears is positive ($r = .132, p < .01$), the negative coefficient was likely due to a suppression effect from other variables in the analysis.

For claustrophobic fears, injury sensitivity ($sr^2 = .006$) and expectancies of panic ($sr^2 = .200$) were significant. Although fear of negative evaluation had a positive zero-order correlation with claustrophobic fears ($r = .037$, $p < .05$), it had a negative and significant regression coefficient in this analysis ($\beta = -.084$, $sr^2 = .006$).

For social fears, seven variables contributed significant unique variance. Sex ($sr^2 = .007$), sensitivity to anxiety-related sensations ($sr^2 = .009$), fear of negative evaluation ($sr^2 = .018$), expectancies of panic ($sr^2 = .118$) and expectancies of criticism or embarrassment ($sr^2 = .009$) were positive predictors. Injury sensitivity ($sr^2 = .008$) and expectancies of physical injury ($sr^2 = .009$) were also significant, although regression coefficients were negative, again suggesting a suppression effect.

Consideration of order effects. It is notable that it was common for sensitivity regression coefficients to be significant in Step 2 but not significant in Step 3 (Appendix J). Presumably, when expectancies were added in Step 3, a considerable amount of variance was shared with these sensitivities, rendering their contribution non-significant. In other words, the relationship between sensitivities and fears were mediated by expectancies. To explore this issue further, a series of four *post hoc* regression analyses (one per fear subtype) was conducted that entered expectancies as a block before sensitivities. In these analyses, the step containing expectancies predicted a significant amount of variance in each fear subtype (animals $R^2\Delta = .428$, $p < .001$; BII $R^2\Delta = .456$, $p < .001$; claustrophobic $R^2\Delta = .438$, $p < .001$; social $R^2\Delta = .414$, $p < .001$). However, the step containing sensitivities was only significant for claustrophobic and social fears (animals $R^2\Delta = .005$, *ns*; BII $R^2\Delta = .007$, *ns*; claustrophobic $R^2\Delta = .015$, $p < .05$; social $R^2\Delta = .034$, $p < .001$). This finding provides some indication that instead of a moderating relationship, the relationship between sensitivities and fears is mediated by expectancies.

Table 11

Summary of Hierarchical Regression Analysis for Variables Predicting Animal Fears (N = 425)

Variable	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step 1							.09***	.09	.88
Step 2							.10***	.19	.18
Step 3							.33***	.52	.51
Step 4							.01**	.54	.52
Sex	.21	.08	.10**	.06	.36	.009			
Injury Sensitivity Index	.04	.04	.04	-.05	.12	.001			
ASI-Physical Symptoms	.04	.04	.04	.06	.21	.014			
Disgust Scale-2	.14	.04	.14***	-.05	.12	.001			
ASI- Anxiety-Related Cognitions	-.04	.04	-.04	-.12	.04	.001			
BFNE Scale	-.04	.04	-.04	-.12	.03	.002			
Expectancies of physical injury	.08	.05	.08	-.02	.18	.003			
Expectancies of panic	.48	.05	.48***	.39	.56	.129			
Expectancies of contamination	>-.01	.05	>-.01	-.11	.10	>.001			
Expectancies of losing mental control	.06	.05	.06	-.05	.16	.001			
Expectancies of being criticized	.11	.05	.11*	.02	.20	.007			
Step 5							.01[†]	.55[a]	.53

Note. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"

[a] $R = .741$, $F(16,403) = 30.68$, $p < .001$.

[†] $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 12

Summary of Hierarchical Regression Analysis for Variables Predicting BII Fears (N = 425)

Variable	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step 1							.02**	.02	.02
Step 2							.09***	.12	.10
Step 3							.37***	.48	.47
Step 4							.01*	.50	.48
Sex	.11	.08	.06	-.04	.27	.003			
Injury Sensitivity Index	.02	.04	.02	-.06	.11	>.001			
ASI-Physical Symptoms	.07	.04	.07	-.02	.15	.003			
Disgust Scale-2	.05	.04	.05	-.03	.13	.002			
ASI- Anxiety-Related Cognitions	-.07	.04	-.07†	-.16	.01	.004			
BFNE Scale	-.01	.04	-.01	-.09	.07	>.001			
Expectancies of physical injury	-.14	.05	-.14**	-.24	-.04	.010			
Expectancies of panic	.61	.04	.61***	.52	.70	.247			
Expectancies of contamination	.12	.05	.12**	.03	.21	.009			
Expectancies of losing mental control	.08	.06	.08	-.03	.20	.003			
Expectancies of being criticized	-.02	.05	-.02	-.13	.08	>.001			
Step 5							.01	.50[a]	.48

Note. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"

[a] $R = .708$, $F(16,403) = 25.34$, $p < .001$.

† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 13

Summary of Hierarchical Regression Analysis for Variables Predicting Claustrophobic Fears (N = 425)

Variable	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step 1							.05***	.05	.05
Step 2							.10***	.15	.14
Step 3							.35***	.50	.49
Step 4							<.01	.50	.49
Sex	.09	.08	.04	-.07	.25	.001			
Injury Sensitivity Index	.10	.04	.10*	.01	.18	.006			
ASI-Physical Symptoms	.05	.04	.05	-.03	.14	.002			
Disgust Scale-2	.02	.04	.02	-.06	.10	>.001			
ASI- Anxiety-Related Cognitions	-.02	.04	-.02	-.11	.06	>.001			
BFNE Scale	-.09	.04	-.08*	-.16	-.01	.006			
Expectancies of physical injury	-.02	.05	-.02	-.10	.07	>.001			
Expectancies of panic	.60	.05	.60***	.51	.69	.200			
Expectancies of contamination	.01	.05	.01	-.09	.11	>.001			
Expectancies of losing mental control	.09	.05	.09†	>.01	.19	.004			
Expectancies of being criticized	.02	.04	.02	-.07	.11	>.001			
Step 5							>.01	.50[a]	.48

Note. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"

[a] $R = .709$, $F(16,403) = 25.42$, $p < .001$.

$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 14

Summary of Hierarchical Regression Analysis for Variables Predicting Social Fears (N = 425)

Variable	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step 1							.04***	.04	.04
Step 2							.22***	.26	.25
Step 3							.23***	.49	.48
Step 4							>.01	.49	.48
Sex	.19	.08	.09*	.03	.35	.007			
Injury Sensitivity Index	-.11	.04	-.11*	-.19	-.02	.008			
ASI-Physical Symptoms	.12	.04	.12*	.03	.20	.009			
Disgust Scale-2	.07	.04	.07†	-.01	.15	.004			
ASI- Anxiety-Related Cognitions	.02	.04	.02	-.07	.11	>.001			
BFNE Scale	.16	.04	.16***	.08	.24	.018			
Expectancies of physical injury	-.11	.04	-.10**	-.19	-.03	.009			
Expectancies of panic	.45	.05	.45***	.36	.54	.118			
Expectancies of contamination	.02	.04	.02	-.07	.10	>.001			
Expectancies of losing mental control	.09	.05	.09†	>-.01	.18	.004			
Expectancies of being criticized	.11	.04	.11**	.03	.20	.009			
Step 5							.01	.50[a]	.48

Note. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"

[a] $R = .705$, $F(16,403) = 24.83$, $p < .001$.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 15

Hypotheses (Hypothesis 3) and Significant Contributors in Four Fear Models.

Variables	Animal	BII	Claustrophobic	Social
		Sensitivities		
Injury	O/ns	O/ns	+	-
Physical symptoms of anxiety			O/ns	+
Disgust	O/+	O/ns		
Anxiety-related cognitions			O/ns	
negative evaluation	O/ns		-	O/+
		Expectancies		
Physical injury	O/ns	-	O/ns	-
Panic	+	O/+	O/+	+
Contamination	O/ns	O/+		
Lose mental control				
Being criticized				O/+

Note. An "O" denotes a hypothesis of a positive and significant relationship between variables. A "+" signifies that the results indicate a positive and significant relationship between variables whereas a "-" indicates a negative and significant relationship. The letters "ns" signify that a significant relationship was expected but not found. Empty cells indicate no hypotheses nor significant relationships were observed.

Discussion

This experiment provided the most comprehensive test of Reiss' expectancy theory to date. There were two primary aims of this experiment: test Reiss' moderation model of expectancy theory and test the ability of disgust sensitivity and contamination expectancies to predict fearfulness in the context of expectancy theory. It was predicted that with the inclusion of revised sensitivity measures, the use of a broad survey of outcome expectancies, and an innovative research design, expectancy theory would be supported. However, the results of this experiment did not support the moderation model of expectancy theory; in hierarchical regression analyses, the addition of interaction terms did not significantly improve the amount of variance accounted for in fears beyond sensitivities and expectancies alone (Hypothesis 1).

However, in support of Hypothesis 2, disgust sensitivity and contamination expectancies accounted for variance in animal and BII fears beyond the effects of the other sensitivities and expectancies. As expected, disgust sensitivity and contamination expectancies were not related to claustrophobic nor social fears. Results are consistent with various studies that have found disgust and concerns about contamination to be particularly associated with BII stimuli and disgust-relevant animals (Woody & Teachman, 2000). The partial correlation for disgust sensitivity and animal fear was positive and significant, whereas, unexpectedly, the partial correlation between disgust sensitivity and BII fear was not significant. Conversely, contamination expectancies were related to BII fear but not animal fear.

Partial support was found for the hypothesized associations between sensitivities and expectancies with fears, as summarized in Table 15 (Hypothesis 3). Although bivariate correlations were significant for all hypothesized relationships between predictors and fears, nine of the 15 hypothesized relationships in the regression analyses were not significant. It appears that the inclusion of multiple, moderately correlated predictors attenuated the relationships between certain predictors and fears. That is, when the variance associated with the other predictors was accounted for, several hypothesized relationships were no longer significant. For instance, for animal fears injury sensitivity was a significant predictor when entered into the regression with the other sensitivities. However, when the expectancies were added to the regression, injury sensitivity no longer explained significant variance in animal fears. This is an example of how unexpected correlations between sensitivities and expectancies could reduce the apparent relationship between predictors and fears in the regression analyses.

As predicted, animal fears were predicted by disgust sensitivity; BII fears were predicted by expectancies of panic and contamination; claustrophobic fears were predicted by expectancies of panic; and social fears were predicted by fear of negative evaluation and expectancies of criticism. In addition, several unexpected relationships were observed, such as the positive and significant partial correlation between injury sensitivity and claustrophobic fears. Although "sex" was added as a covariate and was not a predictor of interest in these analyses, it should be mentioned that sex accounted for a significant portion of the variance in the first step of each analysis (2-9%). In each case, females scored higher than males. After the addition of sensitivities and expectancies, sex was still a significant predictor of animal and social fears.

Several unexpected negative relationships were observed as well. For example, whereas the bivariate correlation between expectancies of physical injury and social fears is not significant, the partial correlation between these variables in the regression analysis was negative and significant. Occasionally these suppression effects occur in regression when one (or multiple) predictor accounts for variance both in the "suppressed" predictor and the dependent variable. The resulting partial correlation between the suppressed predictor and the dependent variable reflects the relationship between these variables after the shared relationship with a third variable is accounted for (i.e., suppression effect). Such suppression effects are difficult to interpret in the context of more than two predictors. In this case, it is helpful to consider the bivariate correlation, which in this case is not significant.

A secondary aim of this study was the development of a measure of outcome expectancies that could be used to test expectancy theory. To date, no measure has been developed that can be used to comprehensively test expectancy theory. Such a measure needs to be built on the foundations of Reiss' expectancy theory as well as inclusive of outcome expectancies typically reported in the fear and phobia literature. Expectancy theory introduced three expectancies: anxiety, danger (i.e., injury), and social disaster. However, prior tests of expectancy theory, clinical research on phobias, and a pilot study conducted in our lab to support the use of five categories of expectancies: physical injury; panicky bodily sensations; contamination or illness; losing mental control or "go crazy;" and be ridiculed, criticized, or judged by others. These five categories were used in the measure created for this study, the Focus of Apprehension Survey Schedule (FASS). Results of the current study support the inclusion of contamination expectancies, as they predicted BII fears. Results also support the division of anxiety expectancies into two separate entities, expectancies of panicky bodily sensations and expectancies of losing mental control or "going crazy." Expectancies of panicky bodily sensations were a strong predictor of each type of fear, whereas there was a trend for expectancies of losing mental control to be associated with claustrophobic and social fears. Therefore, the FASS appears to be well suited for use in tests of expectancy theory.

Furthermore, results of the pilot study and the current experiment reveal patterns of associations between expectancies and fear subtypes (Tables 2 & A1). For example, individuals with public speaking fears typically reported that they would be very likely to experience panic-like symptoms and be ridiculed, criticized or judged if they were to give a speech. Those with fears of enclosed spaces tended to report that they would be very likely to experience panic-like symptoms and somewhat likely to lose mental control or "go crazy." Those with fears of BII and animal fears reported similar expectations, particularly that they would be very likely to experience panic-like symptoms. However, those with BII fears indicated somewhat more of a likelihood of injury and contamination, whereas those with animal fears were somewhat more likely to expect to lose mental control. Although the FASS requires additional validation, it appears to be well-suited as a broad survey of common outcome expectancies, particularly in the context of expectancy theory.

A notable unexpected finding of this experiment was that sensitivities and expectancies tended to correlate, which introduces important theoretical and statistical problems into an interaction-based model. In a test for an interaction it is expected that both the predictor and the moderator (the variable that affects the direction and/or strength of the relation between the predictor and dependent variable) function independently (i.e., are not causally connected), and it is preferred that the moderator be uncorrelated with the predictor and dependent variable (Baron & Kenny, 1986). Orthogonal independent variables are preferred in an interaction model because correlated independent variables decrease the possibility of the amount of variance accounted for by the interaction term reaching significance. In the case of expectancy theory, it is clear from the discussion above that both sensitivities and expectancies are correlated with the dependent variable (i.e., a measure of distress, fear or avoidance), resulting in ambiguity concerning which variable should be considered the moderator. Furthermore, as mentioned above, there is some indication that expectancies actually mediate the relationship between sensitivities and fears.

More importantly, expectancy theory's assumption that the etiology of sensitivities and expectancies are independent is in need of closer scrutiny. As mentioned above, expectancy theory regards expectancies to be developed through learning experiences, whereas sensitivities are thought to be traits, implying early development, potential biological bases, and relative stability (Reiss & McNally, 1985). With these parameters in mind, it is reasonable to question whether sensitivities might have some bearing on behaviors and cognitions before such learning experiences present themselves. For example, a child who is timid or shy may be unwilling to participate in a school play out of fear of being embarrassed, even though he or she has had no prior distressing experience performing in front of others. In that case, the child's expectation of embarrassment is not based on experience, but rather an expectation based on a disposition to fear negative evaluation. This is not unlike the commonly observed phenomenon in agoraphobia, in which several situations are feared and avoided, regardless of whether the individual has ever been exposed to those situations (Goldstein & Chambless, 1978). These examples demonstrate how outcome expectancies may be influenced or even developed from traits such as Reiss's sensitivities. Experiment 2 draws from the results of Experiment 1 and tests a model of expectancy theory in which expectancies mediate the relationships between sensitivities and fears.

Experiment 2

Aims and Implications

Experiment 1 provided support for expectancy theory's contention that sensitivities and expectancies are related to fears. However, Experiment 1 did not support a moderation model of expectancy theory as described by Reiss (1991). Instead, as reviewed above, the data suggests that the relationship between sensitivities and fears is *mediated* by expectancies. For example, in the regression analysis predicting animal fears, injury sensitivity was a significant predictor until the expectancies were added, which resulted in reducing to non-significance the semipartial correlation between injury sensitivity and animal fears. Consequently, the primary aim of Experiment 2 was to test a mediation model of expectancy theory using the same dataset and measures used in Experiment 1. There are several implications of Experiment 2 that parallel those listed for Experiment 1 above. First, by identifying the relationships between sensitivities, expectancies, and fears, we can develop a better understanding of the mechanisms that relate to the development and maintenance of fear and phobias. Furthermore, identifying the relationships between these variables can aid in the prevention and treatment of phobias.

Support for a Mediation Model of Expectancy Theory

To build evidence for a mediation model of expectancy theory, it is necessary provide examples of the link between sensitivities and expectancies beyond the findings in Experiment 1. Although a literature review and examination of several books related to anxiety and expectancies (Barlow, 2002; Kirsch, 1999; Taylor, 1999) provided no examples of studies in which the relationship between Reiss's sensitivities and expectancies were directly examined, a number of studies have shown that anxiety sensitivity and fear of negative evaluation are related to expectancy-related cognitive biases. For example, panic disorder and agoraphobic patients (who score high on measures of anxiety sensitivity) tend to interpret ambiguous information as threatening (Stoler & McNally, 1991) or anxiety-related (Kamieniecki, Wade, & Tsourtos, 1997). Healthy subjects with high anxiety sensitivity also tend to interpret ambiguous internal and external events as threatening (McNally, Hornig, Hoffman, & Hans, 1997 as cited in McNally, 1999). Although these studies did not examine expectancy biases toward feared objects or situations directly, it is clear that anxiety sensitivity can influence beliefs about outcomes. In addition, the idea that fear of negative evaluation leads to beliefs that rejection or loss of status will occur in social situations is considered by some to be the hallmark of social phobia (e.g. Turner, Beidel & Townsley, 1992). Evidence is provided by several studies that have found that social phobics (who tend to score higher on fear of negative evaluation) tend to interpret ambiguous social situations as more negative than other anxiety patients and healthy controls (e.g., Stopa & Clark, 2000) and estimate the probability and cost of negative social outcomes as greater than non-anxious controls (e.g., Foa et al., 1996).

Hence, there are several examples of how sensitivities may influence outcome expectancies, further eroding support for expectancy theory's moderation model yet encouraging exploration of a mediation model. By integrating the research reviewed above, a plausible alternative to expectancy theory can be offered in which expectancies mediate the relationship between sensitivities and fears. For example, a fear of negative evaluation may influence the expectation that an individual will be embarrassed or humiliated in social situations such as giving a speech, in turn increasing fearfulness and avoidance of such situations.

It is an interesting footnote that a reformulation of Reiss' expectancy theory that regards expectancies to be mediators of the sensitivities-fears relationship may be consistent with Clark's (1986, 1988) cognitive model of panic attacks. In Clark's view, panic attacks are born from the misappraisal of anxiety-relevant bodily sensations as catastrophically dangerous, including palpitations, dizziness, and shortness of breath. Clark's (1988) model suggests that an enduring cognitive trait influences the belief that these physical sensations are more dangerous than they really are, which results in a susceptibility to the development of panic disorder. Cox (1996) suggested that anxiety sensitivity might represent the cognitive risk factor that Clark (1988) regards as influencing these catastrophic misappraisals of bodily sensations. Indeed, there is a strongly-supported relationship between anxiety sensitivity and panic disorder, particularly for the panic-relevant symptoms such as rapid heart beat, shortness of breath, and feeling shaky or faint (Apfeldorf, Shear, Leon, & Portera, 1994; Hazen, Walker, & Stein, 1995 as cited in Cox et al., 1999; Taylor et al., 1992). In that regard, anxiety sensitivity is thought to influence interpretations of bodily sensations, which subsequently influences outcome expectancies. However, beyond the moderator-mediator issue, the theoretical underpinnings of expectancy theory can be contrasted with Clark's theory by the fact that expectancy theory anticipates that anxiety sensitivity influences fearfulness without expectation of catastrophic misappraisals of certain bodily sensations (McNally, 1994).

Proposal of a Mediation Model of Expectancy Theory

Experiment 2 examines a mediation expectancy model of fearfulness by including measures of expectancies in a modification of Taylor's (1993) approach to examining the relationship between Reiss's three sensitivities and fears. Using regression analyses and canonical correlation, Taylor (1993) found that the sensitivities were able to predict a significant portion of variance in social, situational, animal, and BII fears as measured by subscales of a modified Fear Survey Schedule-III (FSS-III; Wolpe & Lang, 1964). Although Taylor did not include measures of expectancies, his approach to examining expectancy theory provides an excellent base for examining a more comprehensive model. If sensitivities influence fearfulness of phobic stimuli by potentiating the expectancy of future aversive outcomes, that relationship should be able to be modeled and tested.

Summary of Analytic Methods

To test the mediation model in the current study, path analysis using LISREL 8.54 (Jöreskog & Sörbom, 2003) will be utilized. This method represents a general approach to statistically examine the degree to which a theoretical model fits empirical data. Instead of a significance test using a *p* value, LISREL produces fit indices that relate to how well an estimated correlation or covariance matrix based on the theoretical model matches the observed correlation or covariance matrix. As with path analysis using regression, paths between variables in LISREL path analysis can be unidirectional, multidirectional (i.e., reciprocal), or correlational, depending on the theorized relationship. Using such an approach has several advantages over the canonical correlation used in Taylor's (1993) study of expectancy theory. Canonical correlation is useful as a screening or descriptive technique, but is typically not the best choice for hypothesis testing (Tabachnick & Fidell, 2001). The primary drawback to using canonical correlation is the interpretability of the results: the algorithm maximizes the linear relationship between two sets of variables, but a stronger correlation does not necessarily infer the best interpretation of the pairs of canonical variates. Furthermore, the algorithm is very sensitive to changes in one variable, and interpreting the results of changes is difficult.

One strength of SEM is that it allows for a simultaneous test of all relationships in the model. Also, one can better evaluate the impact of individual predictor variables on criterion variables. Furthermore, SEM is able to test mediation models more parsimoniously than other regression approaches. The proposed mediation model is illustrated in Figure 3. As shown, it retains the pairings of sensitivities and expectancies that are laid out in expectancy theory. However, each sensitivity-expectancy-fear triad is organized as a partial mediation model. The detailed strategy for the mediation analyses is presented in the Results section below.

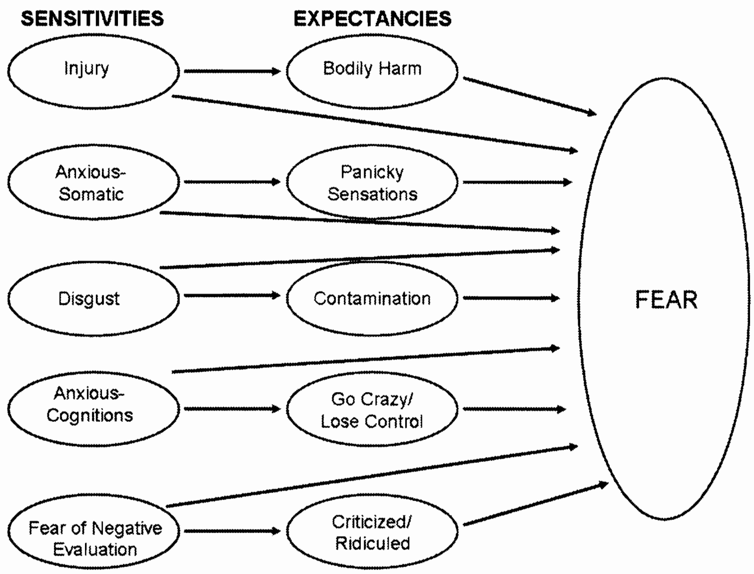

Figure 3. Proposed mediation model of expectancy theory.

Hypotheses

1. A partial mediation model of expectancy theory will provide a better fit to the data than a full mediation model or a non-mediated model as tested by the χ^2 difference test.

2. A partial mediation model will provide a good fit to the data as established by commonly-utilized fit indices (e.g., NNFI, GFI, RMSEA).

3. The relationship between sensitivities and fears are mediated by expectancies. In particular,

    a. Expectancies of contamination will mediate the relationship between disgust sensitivity and *animal fears*.

    b. Expectancies of physical injury will mediate the relationship between injury sensitivity and *animal fears*.

c. Expectancies of contamination will mediate the relationship between disgust sensitivity and *BII fears*.

d. Expectancies of panic will mediate the relationship between sensitivity to anxiety-related physical symptoms and *BII fears*.

e. Expectancies of panic will mediate the relationship between sensitivity to anxiety-related physical symptoms and *claustrophobic fears*.

f. Expectancies of losing control or "going crazy" will mediate the relationship between sensitivity to anxiety-related cognitions and *claustrophobic fears*.

g. Expectancies of embarrassment, ridicule, and criticism will mediate the relationship between fear of negative evaluation and *social fears*.

Methods

The data set used in Experiment 1 was also used for this experiment. Therefore, participants, data collection methods, and strategies for developing measures were identical to those outlined in Experiment 1.

Results

As reviewed above, the current literature suggests that expectancies mediate the relationship between sensitivities and fears. Analyses of the moderation model demonstrated that disgust sensitivity and contamination expectancies are predictors of fears, and therefore these two variables were included in the mediation models. Path analyses using LISREL 8.54 (Jöreskog & Sörbom, 2003) were conducted for each fear in order to compare three models: non-mediated, full mediation, and partial mediation. In the partial mediation model, each sensitivity has a direct path to its corresponding expectancy and to the fear, and each expectancy has a direct path to the fear (Figure 3). In the non-mediated model, each sensitivity and expectancy has one direct path to the fear. In the full mediation model, each sensitivity has a direct path to its corresponding expectancy, which in turn has a direct path to the fear. Sex was included to each model as a covariate, and as such, has direct paths to endogenous variables (i.e., expectancies and fears). It was expected that the partial mediation model would provide a good fit to the data and would be superior to the other two models (Hypotheses 1 & 2). Furthermore, it was hypothesized that several sensitivity-fear relationships would be mediated by expectancies (Hypothesis 3).

Parameters were estimated using maximum likelihood (ML) estimation and all analyses were based on the covariance matrix. The χ^2 difference test was employed to provide a significance test of the relative goodness of fit between the non-mediated, full mediation, and partial mediation models (Hypothesis 1). Model fit for the partially mediated model (Hypothesis 2) was assessed by several common indices: Full

Information ML χ^2 (chi-square) index, Non-Normed Fit Index (NNFI; Bentler & Bonnet, 1980), Comparative Fit Index (CFI; Bentler, 1990), and the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993). Criteria for what constitutes a "good" or "acceptable" fit is controversial and of continuous debate (e.g., Cudeck, & Henly, 1991; Hu and Bentler, 1999; Marsh, Hau, & Wen, 2004). For this study, generally accepted guidelines for fit index cutoff scores were used to evaluate model fit (NNFI > .90, CFI > .90, GFI > .90, RMSEA < .08; Kline, 2005). Data for five participants who did not specify sex were excluded from analyses ($N = 420$).

Comparison of Mediation Models

Hypothesis 1 proposed that a partial mediation model of expectancy theory would provide a better fit to the data than a full mediation model or a non-mediated model. For each of the four fear subtypes, χ^2 difference tests indicated that the partial mediation model provided a better fit than the non-mediated model (Table 16). In addition, for animal, social, and claustrophobic fears, the partial mediation model provided a better fit than the full mediation model (Table 16). Therefore, results support Hypothesis 1. The χ^2 difference test is not available for comparing models with the same degrees of freedom, so the fully mediated and non-mediated models could not be statistically compared. However, evaluation of the χ^2 values and fit indices suggests that for each of the four fear subtypes, the full mediation model was superior to the non-mediated model. Squared multiple correlations for fear variables are provided in Table 17.

Table 16
Chi-Square Statistics, Degrees of Freedom, and Results of Chi-Square Difference Tests.

	χ^2 (df)			
Fears	Partial mediation (PM)	Full mediation (FM)	Non-mediated (NM)	χ^2 Difference Test
Animal	905.02** (30)	921.86** (35)	1047.78** (35)	PM < FM**, NM**
BII	823.00** (30)	828.55** (35)	906.15** (35)	PM < NM**
Claustrophobic	654.78** (30)	667.34** (35)	773.60** (35)	PM < FM*, NM**
Social	421.41** (30)	453.55** (35)	571.49** (35)	PM < FM**, NM**

Note. Chi-square $N = 420$.
* $p < .05$. ** $p < .01$.

Table 17
Squared Multiple Correlations for the Three Models.

	R^2		
Fears	Partial mediation	Full mediation	Non-mediated
Animal	0.44	0.43	0.43
BII	0.48	0.47	0.47
Claustrophobic	0.47	0.44	0.45
Social	0.42	0.39	0.38

Model Fit for the Partially-Mediated Models

Hypothesis 2, which proposed a partial mediation model of expectancy theory would demonstrate a good fit to the data, was not supported. Across the four fear subtypes, fit indices for the partial mediation models did not meet fit criteria outlined above. In other words, results indicated that the proposed model did not well represent the observed data (Table 18). Model fit can be influenced by many factors, including omitted variables, properties of the study variables, and paths omitted in the model (Kelloway, 1998). An examination of the residuals matrix and modification indices for these models revealed two potential reasons for the poor fit: correlations between sensitivities and non-associated expectancies, and correlations between expectancies. These issues receive further attention in the discussion below.

Table 18
Fit Indices for the Three Competing Models.

	Fit indices		
Fears	RMSEA	NNFI	CFI
	Partial mediation		
Animal	.30	.36	.71
BII	.28	.23	.65
Claustrophobic	.26	.41	.73
Social	.19	.56	.80
	Full mediation		
Animal	.27	.44	.70
BII	.26	.34	.65
Claustrophobic	.24	.49	.73
Social	.18	.60	.79
	Non-mediated		
Animal	.32	.36	.66
BII	.29	.28	.62
Claustrophobic	.28	.40	.68
Social	.22	.49	.73

Note. Chi-square Ns = 425. RMSEA = root-mean-squared error of approximation; NNFI = Non-Normed Fit Index; CFI = comparative fit index.

Direct Effects and Mediated Relationships

Hypothesis 3 posits that certain relationships between sensitivities and fears are mediated by expectancies. Specific predictions are highlighted in the following discussion of direct and indirect effects in the partial mediation models for each of the four fear models. Of note, hypotheses concerning mediated relationships were considered supported if the relationship was partially or fully mediated. Furthermore, these hypotheses and outcomes are presented in Table 19. The relationships between variables are illustrated in Figures 4 through 7 and standardized path coefficients are presented in Tables 20 through 23.

Animal fears. Direct paths to animal fears were positive and significant from disgust sensitivity, expectancies of physical harm, expectancies of panic, and expectancies of criticism (Figure 4). Sex also predicted animal fears, with females reporting higher fear. Furthermore, in support of Hypothesis 3b, the relationship between injury sensitivity and animal fears was fully mediated by expectancies of physical harm (β for indirect effect = .03, $p < .05$) and the relationship between sensitivity to the physical symptoms of anxiety and animal fears was fully mediated by expectancies of panic (β for indirect effect = .16, $p < .001$). Unexpectedly, neither fear of negative evaluation nor expectancies of contamination were predictors of animal fears. Therefore, the prediction that expectancies of contamination would mediate the relationship between disgust sensitivity and animal fears was not supported (Hypothesis 3a).

BII fears. Direct paths to BII fears were positive and significant from expectancies of panic, contamination, and losing mental control (Figure 5). Unexpectedly, but consistent with results of the regression analyses reviewed above, expectancies of physical harm was negatively and significantly related to BII fears. As predicted (Hypothesis 3c), the relationship between disgust sensitivity and BII fears was fully mediated by expectancies of contamination (β for indirect effect = .03, $p < .01$). Also as predicted (Hypothesis 3d) the relationship between sensitivity to physical symptoms of anxiety and BII fears was fully mediated by expectancies of panic (β for indirect effect = .19, $p < .001$) and the relationship between the sensitivity to anxiety-related cognitions (i.e., sensitivity to anxiety-related cognitions) and BII fears was fully mediated by the expectancy to lose mental control (β for indirect effect = .02, $p < .05$).

Claustrophobic fears. Direct paths to claustrophobic fears were positive and significant from injury sensitivity, expectancies of panic, and losing mental control (Figure 6). Sex also predicted claustrophobic fears, with females reporting higher fear. Furthermore, as with the regression analysis presented above, the path from fear of negative evaluation to claustrophobic fears was negative and significant. Consistent with expectations (Hypothesis 3e), the relationship between sensitivity to physical symptoms of anxiety and claustrophobic fears was fully mediated by expectancies of panic (β for indirect effect = .20, $p < .001$). Also, consistent with Hypothesis 3f, the relationship between sensitivity to anxiety-related cognitions and claustrophobic fears was fully mediated by the expectancy to lose mental control (β for indirect effect = .03, $p < .05$).

Social fears. Direct paths to social fears were positive and significant from sensitivity to physical symptoms of anxiety, fear of negative evaluation, and expectancies of panic, losing mental control, and criticism/ridicule (Figure 7). Sex also predicted social fears, with females reporting higher fear. Again, consistent with the regression analysis presented above, the paths from injury sensitivity and expectancies of physical injury to claustrophobic fears were negative and significant. Consistent with Hypothesis 3g, the relationship between fear of negative evaluation and social fears was partially mediated by expectancies of criticism/ridicule (β for indirect effect = .04, $p < .01$). Also, the relationship between sensitivity to physical symptoms of anxiety and social fears was partially mediated by expectancies of panic (β for indirect effect = .13, $p < .001$) while the relationship between the sensitivity to anxiety-related cognitions and social fears was fully mediated by the expectancy to lose mental control (β for indirect effect = .04, $p < .01$).

Table 19
Hypotheses (Hypothesis 3) and Results Concerning Mediation in Four Fear Models.

Path to fears	Animal	BII	Claustro-phobic	Social
Injury sensitivity - expectancy A	O/+			
Sensitivity to physical symptoms of anxiety - expectancy B	+	O/+	O/+	+
Disgust sensitivity -expectancy C	O/ns	O/+		
Sensitivity to anxiety-related cognitions – expectancy D		+	O/+	+
Fear of negative evaluation - expectancy E				O/+

Notes. An "O" denotes a hypothesis of a positive and significant relationship between variables. A "+" signifies that the results indicate a positive and significant relationship between variables whereas the letters "ns" signify that a significant relationship was expected but not found. Empty cells indicate no hypotheses nor were significant relationships observed. Expectancy A = expectancies of physical injury; expectancy B = expectancies of panic; expectancy C = expectancies of contamination; expectancy D = expectancies of losing mental control; expectancy E = expectancies of being criticized.

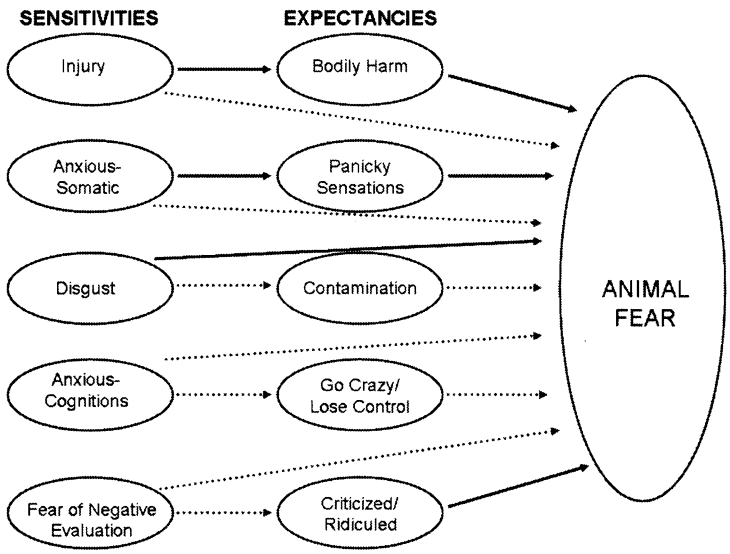

Figure 4. Significant paths (in bold) for the relationships between sensitivities, expectancies, and animal fears.

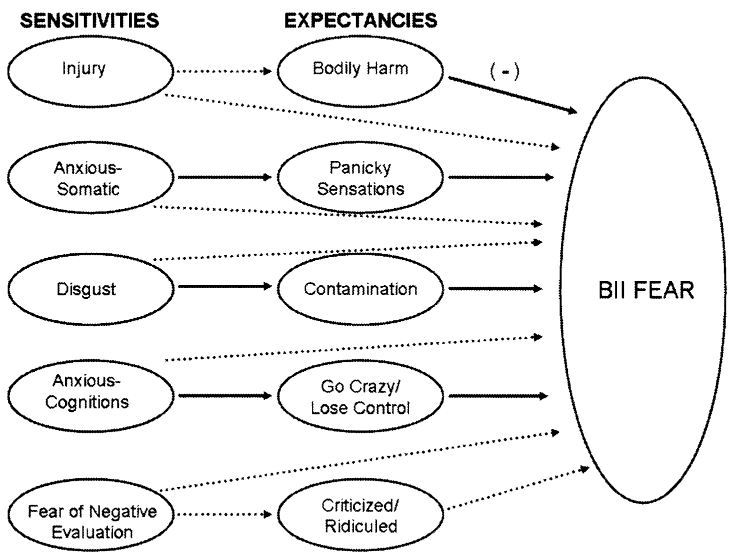

Figure 5. Significant paths (in bold) for the relationships between sensitivities, expectancies, and BII fears.

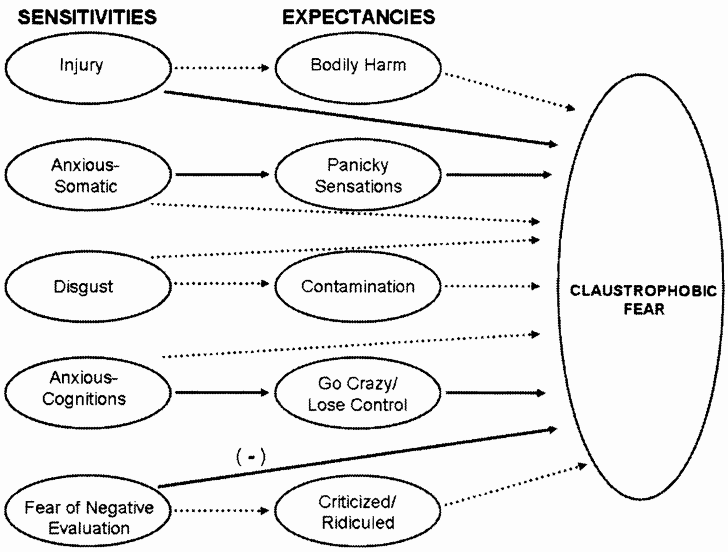

Figure 6. Significant paths (in bold) for the relationships between sensitivities, expectancies, and claustrophobic fears.

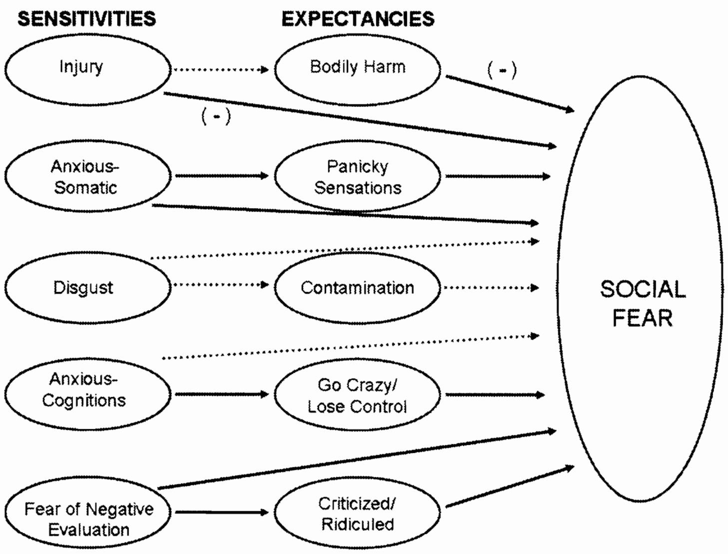

Figure 7. Significant paths (in bold) for the relationships between sensitivities, expectancies, and social fears.

Table 20

Standardized Path Coefficients for Animal Fear Model

	Gamma						Beta
	Injury Sensitivity Index	ASI-Physical Symptoms	Disgust Scale 2	ASI-Anxiety-Related Cognitions	BFNE Scale	Sex	Animal fears
Animal fears	.04	.03	.15***	-.04	.05	-.11**	--
Expectancies of physical injury	.30***	--	--	--	--	.04	.09
Expectancies of panic	--	.31***	--	--	--	.20***	.53***
Expectancies of contamination	--	--	.31***	--	--	-.07	>.01
Expectancies of losing mental control	--	--	--	.22***	--	.10*	.06
Expectancies of being criticized	--	--	--	--	.02	.06	.12**

Note. Dashes indicate the path was not estimated. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"

† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 21
Standardized Path Coefficients for BII Fear Model

	Gamma						Beta
	Injury Sensitivity Index	ASI-Physical Symptoms	Disgust Scale 2	ASI-Anxiety-Related Cognitions	BFNE Scale	Sex	BII fears
BII fears	.03	.05	.05	-.07	-.01	.06	--
Expectancies of physical injury	.08	--	--	--	--	-.09	-.14***
Expectancies of panic	--	.31***	--	--	--	.03	.62***
Expectancies of contamination	--	--	.21***	--	--	-.07	.13***
Expectancies of losing mental control	--	--	--	.21***	--	-.07	.08*
Expectancies of being criticized	--	--	--	--	.09	-.06	-.02

Note. Dashes indicate the path was not estimated. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"
† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 22
Standardized Path Coefficients for Claustrophobia Model

	Gamma						Beta
	Injury Sensitivity Index	ASI-Physical Symptoms	Disgust Scale 2	ASI-Anxiety-Related Cognitions	BFNE Scale	Sex	Claustrophobic fears
Claustrophobic fears	.10*	.04	.02	-.02	-.09*	.05	--
Expectancies of physical injury	.23***	--	--	--	--	-.02	-.02
Expectancies of panic	--	.33***	--	--	--	.18***	.62***
Expectancies of contamination	--	--	.07	--	--	-.01	.01
Expectancies of losing mental control	--	--	--	.30***	--	.03	.09*
Expectancies of being criticized	--	--	--	--	.13**	.01	.02

Note. Dashes indicate the path was not estimated. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 23
Standardized Path Coefficients for Social Model

	Gamma						Beta
	Injury Sensitivity Index	ASI-Physical Symptoms	Disgust Scale 2	ASI-Anxiety-Related Cognitions	BFNE Scale	Sex	Social fears
Social fears	-.12**	.14**	.08	.01	.16***	.10*	--
Expectancies of physical injury	.11**	--	--	--	--	-.05	-.11**
Expectancies of panic	--	.28***	--	--	--	.10	.47***
Expectancies of contamination	--	--	.03	--	--	-.04	.02
Expectancies of losing mental control	--	--	--	.34***	--	.05	.09*
Expectancies of being criticized	--	--	--	--	.36***	.12	.12**

Note. Dashes indicate the path was not estimated. ASI = "Anxiety Sensitivity Index." BFNE = "Brief Fear of Negative Evaluation"
$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$

Discussion

Experiment 2 tested a mediation model of expectancy theory. As predicted, a partial mediation model provided a superior fit compared to the full mediation and non-mediated models (Hypothesis 1). Although the partial mediation model was superior to these competing models, this does not guarantee that the theoretical partial mediation model provides a good fit to the observed data. In fact, for each of the four fear subtypes, the partial mediation model provided an inadequate fit to the observed data. Therefore, Hypothesis 2 was not supported.

Two primary explanations for the poor model fit were indicated. First, expectancy theory assumes that expectancies are not correlated. However, in the current study, expectancies were commonly correlated with other expectancies. These results differ from the conclusions of Gursky and Reiss (1987), who interpreted the results of an exploratory factor analysis of an expectancy questionnaire as supporting the distinctiveness of anxiety and danger expectancies. It is notable that Gursky and Reiss considered a wide range of expectancies to be considered "danger expectancies," such as expecting to be heckled or laughed at while giving a speech. In contrast, the current study made a distinction between these expectations of "social catastrophe" and "physical injury." More importantly, the correlations between anxiety and danger expectancies in the Gursky and Reiss study were positive and of moderate strength (.59 to .67 for three common fears), comparable to the findings of the current study (.12 to .55 for the four fear subtypes). Thus, it appears that although Gursky and Reiss provided evidence that anxiety expectancies are somewhat distinct from other expectancies, their findings were also consistent with the current study's findings that expectancies tend to have moderate and positive intercorrelations.

Another contributor to the poor model fit observed in this study was that expectancies also tended to be correlated with non-associated sensitivities (e.g., for animal fears, injury sensitivity was correlated with expectancies of panic). One procedure that may be employed to improve model fit is to estimate paths between variables that are correlated (i.e., add paths between variables in the model). Unfortunately, the theoretical model based on expectancy theory does not predict relationships between sensitivities and non-associated expectancies and therefore does not provide guidance for adding paths. However, it is plausible that the expectancies mediate the relationships between multiple sensitivities and fear as well. For example, perhaps disgust sensitivity is related to animal fears through expectations of panicking in response to contact with a feared animal. Such directional paths (disgust sensitivity to expectancy of panic to animal fear) can simply be added and the model retested.

A post hoc path analysis for animal fears was conducted to explore the possibility that adding paths between sensitivities and expectancies (as suggested by modification indices) would improve the model fit. Variables that were not associated with animal fears per the partial mediation model tested above were removed from the analysis to improve parsimony. Results of the analysis indicated that the addition of several paths did not appreciably improve model fit compared to the partial mediation model tested above. However, results did illustrate that the relationship between sensitivities and fears can be mediated by not just one, but several expectancies concurrently. Details of the analysis are presented in Appendix K.

Accounting for correlations between expectancies presents a more vexing problem than unexpected correlations between sensitivities and expectancies. Expectancy theory does not predict correlations between expectancies and does not provide guidance in this regard. More importantly, there is no clear indication how the expectancies are related; do expectancies of panic mediate the relationship between expectancies of injury and animal fears or vice versa? Using LISREL it is possible to correlate the disturbance terms of endogenous variables (i.e., the error terms of the expectancies), although such procedures may violate statistical conditions necessary for estimating the model. Furthermore, correlating disturbance terms typically provides a significant challenge in interpreting results (Kelloway, 1998). With these issues in mind, post hoc attempts were made to test the partial mediation models with the addition of estimated correlations between disturbance terms of the expectancies. However, for each of the four fear subtypes, the modifications could not be successfully modeled (i.e., the models were not identified) and therefore were unable to be tested.

Although additional configurations of study variables could be modeled post hoc, excessive modifications tends to move the focus of path analyses away from confirming theoretical models and toward results that could be spurious and unique to the data set at hand. Therefore, if further hypotheses are to be tested in the context of expectancy theory, it would be advantageous to design a study that can test such predictions, keeping the current findings in mind.

Concerning Hypothesis 3, unlike analysis of variance in which a non-significant omnibus *F*-statistic precludes examination of differences between variables or conditions, path analysis allows for comparisons between study variables even though the model fit is unacceptable. Although the overall mediation model was not supported, there was ample evidence that expectancies often mediate the relationship between sensitivities and fears. In fact, of the seven sensitivity-fear relationships predicted to be mediated by expectancies, six were found to be significant (Table 19). Furthermore, four additional mediated relationships were found. These results provide support for theories that posit fear-related cognitions mediate the relationship between trait-like vulnerabilities and fears. For example, expectancies of panic mediate the relationship between sensitivity to the physical symptoms of anxiety and claustrophobic fears, perhaps paralleling Clark's (1988) model for panic disorder.

General Discussion

Considerable advances in our understanding of the etiology and mechanisms underlying fears and phobias have been made within the past 30 years. Accompanying these developments, several theories of fearfulness have been proposed. The purpose of this study was to test one such approach, Reiss' expectancy theory (Reiss, 1991). Whereas prior research supports the links between sensitivities and outcome expectancies with individual differences in fearfulness, the idea that fears are best predicted by the interaction between these two constructs has yet to be adequately tested. The goal of the current study was to confront limitations of prior studies and provide the first adequate test of expectancy theory.

Moderation Model

Experiment 1 tested Reiss' moderation model of expectancy theory using updated measures and a research design that encompassed the full range of sensitivities, expectancies, and their interactions. Although sets of sensitivities and expectancies accounted for significant variance in fears, the introduction of interaction terms did not improve prediction of fears. This result was consistent with prior studies of expectancy theory that provided mixed findings or no support for Reiss' (1991) proposed moderation model. Therefore, the moderation model of expectancy theory was not supported.

Across the four fear subtypes, 15 expectancies and sensitivities were hypothesized as predictors of fears. Although bivariate correlations for these pairings were significant, only six of the 15 hypothesized predictors of fears were significant when accounting for the effects of all other variables in the model. Predicted positive and significant relationships that were supported included disgust sensitivity predicting animal fears, fear of negative evaluation and expectancies of criticism predicting social fears, expectancies contamination and panic predicting BII fears, and expectancies of panic predicting claustrophobic fears. Unexpectedly, expectancies of panic demonstrated a strong and unique relationship to all four fears. Also, injury sensitivity predicted claustrophobic fears.

A closer examination of the results of regression analyses and correlations suggested that multiple variables shared variance associated with the dependent variable (i.e., fear), effectively reducing the regression coefficients of some variables to non-significance. These results demonstrated a critical shortcoming of Reiss' expectancy theory: counter to assumptions, paired (and unpaired) sensitivities and expectancies tended to correlate. This creates both statistical and theoretical problems for Reiss' expectancy theory. Concerning the statistical aspects of this issue, when independent variables and their moderators are correlated, the impact of an interaction term can be reduced in multiple regression.

In terms of theoretical problems, expectancy theory does not provide an answer to why sensitivities and expectancies would be related. However, as discussed in the Discussion for Experiment 1 and the Introduction to Experiment 2, there is support for the contention that expectancies mediate the relationship between sensitivities and fears. For example, an individual who is particularly sensitive to negative evaluation might be more prone to expect a disastrous interpersonal outcome in social situations and subsequently to fear social situations. Results of Experiment 1 provided some indication that expectancies mediate the relationship between sensitivities and fears, by demonstrating that the order in which blocks of sensitivities or expectancies were entered into the hierarchical regression influenced the interpretation of the analyses. This observation is a good reminder that multiple regression approaches such as the one utilized in Experiment 1 and other studies of expectancy theory may conceal the true nature of complex relationships between variables. Consequently, Experiment 2 was developed to test the suitability of a mediation model of expectancy theory.

Mediation Model

Although the mediation model of expectancy theory proposed in Experiment 2 was not supported, results indicated that in many instances, expectancies mediated the relationships between sensitivities and fears. For example, the relationship between disgust sensitivity and BII fears was fully mediated by expectancies of contamination or illness. This finding can be contrasted to the results of the regression analysis in Experiment 1, which found that expectancies of contamination but not disgust sensitivity contributed unique variance (i.e., had significant regression coefficients) in the prediction of BII fears.

In all, six of seven hypothesized mediated relationships across the four fear subtypes were supported. An additional four mediated relationships were found as well. As expected, expectancies of physical injury mediated the relationship between injury sensitivity and animal fears. Expectancies of criticism, ridicule or embarrassment mediated the relationship between fear of negative evaluation and social fears. This ties together findings that social phobia is associated with both trait-like vulnerabilities (e.g., Rapee & Heimberg, 1997) and exaggerated expectations for negative outcomes in social situations (e.g., Foa et al., 1996). Finally, expectancies of contamination mediated the relationship between disgust sensitivity and BII fears. This relationship was also expected for animal fears, but was not observed in this study. The relationship of disgust sensitivity and contamination expectancies to animal and BII fears are given further consideration below.

Expectancies of panic mediated the relationship between the sensitivity to the physical symptoms of anxiety and each of the four fear subtypes. Furthermore, expectancies of losing mental control mediated the relationship between sensitivity to anxiety-related cognitions and BII, claustrophobic, and social fears. These findings are consistent with the broad claim that anxiety sensitivity is implicated in potentiating fear in response to a wide range of stimuli (Reiss, 1991).

The most consistent finding in Experiment 2 was that for each fear subtype, expectancies of panic mediated the relationship between sensitivity to the physical symptoms of anxiety and fears. This finding can be contrasted to the results of the regression-based test of the moderation model in Experiment 1, which concluded that sensitivity to the physical symptoms of anxiety only explained unique variance in social fears. Apparently, the path analysis approach allowed for the observation of indirect effects of this sensitivity on fears, whereas these effects were lost when entered into a regression simultaneously with other study variables. In effect, this example (as well as others that could be drawn from the study) illustrates how a path analytic approach to examining the relationships between variables can be used to more efficiently describe complex correlational relationships between variables that can lost in multiple regression.

Whereas some theories of fears concentrate on the impact of cognitions such as Wells and Clark's (1997) cognitive approach to social phobia, other theories consider cognitions to be secondary to a conditioning process, such as Barlow's (2002) theory of false and learned alarms (Salkovskis & Hackman, 1997). The results of the current study, in contrast, suggest that cognitions are inextricably associated with various trait vulnerabilities. Although there were a few examples of sensitivities having direct (i.e., unmediated) effects on fears (e.g., Figure 4), the results of a post hoc, modified animal fears model (Appendix K) suggest that all sensitivities are at least partially mediated by expectancies. In other words, it appears that the influence of these trait vulnerabilities on fears is at least partially indirect through their effects on fear-relevant cognitions. Clearly, future studies will need to be conducted to address the question of whether sensitivities can directly affect fearfulness, as non-associative models would suggest (Menzies & Clarke, 1995).

An interesting and novel outcome of this study is that these mediated relationships discriminate between fear subtypes (Table 19). For example, the only fear subtype to have expectancies of physical injury mediate the effect of injury sensitivity is animal fears. BII fears are the only fear subtype that has the effects of disgust sensitivity mediated by expectancies of contamination. Furthermore, social fears are the only ones with the effects of fear of negative evaluation mediated by expectancies of ridicule, criticism, or embarrassment. Claustrophobia, although not associated with a unique sensitivity-expectancy pairing, was distinctive in that only two sensitivity-expectancy pairing had significant mediating relationships: expectancies of panic mediating the effects of sensitivity to physical symptoms of anxiety and expectancies of losing control or "going crazy" mediating the effects of sensitivity to anxiety-related cognitions. Therefore, one application of the methodology used in Experiment 2 is that it can differentiate groupings of common fears.

It may be worth noting that it would be optimal to directly and statistically compare the moderation and mediation models of expectancy theory, perhaps by testing both the moderation and mediation models using LISREL. However, modeling interaction terms in path analysis is a complex and controversial issue that provides significant challenges to the design and interpretation of the analyses (Cortina, Chen, & Dunlap, 2001; Li et al., 1998; Marsh, Wen, & Hau, 2004; Williams, Edwards, & Vandenberg, 2003). Therefore, for the current study, other considerations such as the decision to weight scale items to improve scale characteristics (Grice, 2001) were included in the study at the expense of attempting to test the moderation model in LISREL (cf. Beyers & Goossens, 1999).

Disgust Sensitivity and Contamination Expectancies

In both Experiment 1 and 2, disgust sensitivity and expectancies of contamination or illness demonstrated an ability to predict fears beyond Reiss' fundamental sensitivities and expectancies. In Experiment 2, disgust sensitivity was a significant contributor to the prediction of (disgust-relevant) animal and BII fears beyond the contributions of other sensitivities and expectancies. In addition, for BII fears, the effect of disgust sensitivity was fully mediated by expectancies of contamination or illness. Results were consistent with the literature that generally regards disgust sensitivity to be related to animal fears (primarily snakes and spiders) and BII fears (see Woody & Teachman, 2000). In terms of expectancy theory, the addition of these constructs clearly improves the predictability of certain fears, although their addition does not validate expectancy theory.

The mediating effect of contamination expectancies for BII fears is consistent with the common assertion that the emotion of disgust acts as a protection against certain animals, body products, rotting food, or other objects that may cause contamination (e.g, Matchett & Davey, 1991). In addition, results are consistent with prior findings that contamination fears are particularly associated with BII fears (e.g., Sawchuk et al., 2000). However, it is unexpected that disgust sensitivity would predict animal fears if the trait were not mediated by expectancies of contamination. It is possible that contamination expectancies were not predictive of animal fears because one of the three animals used in this study, "snakes," is sometimes considered "fierce" and not disgust-relevant (Davey et al., 1998). On the other hand, as noted above, disgust sensitivity's effect on animal fear was mediated by expectancies of harm, panic and criticism.

On the other hand, the finding that expectancies of physical injury mediates the relationship between injury sensitivity and animal fears support Öhman's (1986) evolutionary predator-defense hypothesis, which suggests that humans are "prepared" by natural selection to fear certain animals. Perhaps Matchett and Davey's (1991) predictions concerning the relationship between contamination expectancies and disgust sensitivity would hold for disgust-relevant animals (e.g., maggots, worms) but Öhman's theory would be fitting for fierce or aggressive animals (e.g., bears and snakes). The methods used in the current study could be used to test this hypothesis. For example, perhaps expectancies of contamination mediate the relationship between disgust sensitivity and fears of disgust-relevant animals, whereas fears of fierce and aggressive animals would be predicted by the relationship between injury sensitivity and expectancies of physical injury. Repetition of the current study comparing various animal types may resolve this question.

Measuring Outcome Expectancies

A secondary aim of this study was to develop a measure of outcome expectancies that could be used to test expectancy theory. The measure developed for this study, the *Focus of Apprehension Survey Schedule* (FASS) was informed by prior tests of expectancy theory, clinical research on phobias, and a pilot study conducted in our lab. Prior to the current study, the most common method of recording expectancies was likely open-ended interview (e.g., Lipsitz et al., 2002; McNally & Steketee, 1985). Although several studies employed ratings of expectancies (e.g., Antony, et al., 1997; Valentiner et al, 1993) none comprehensively measured the range of expectancies predicted by expectancy theory. Others blurred the boundaries between types of expectancies, such as blending expectancies of social catastrophe with expectancies of physical danger (e.g., Gursky & Reiss, 1987). The FASS appeared to encompass the range of common outcome expectancies, discriminate between fear subtypes, and was useful in testing expectancy theory.

Expectancy theory incorporated three expectancies (anxiety, danger, and social disaster) and early studies included only two, anxiety and danger expectancies (e.g., Gursky & Reiss, 1987). However, more recent accounts of fear-related beliefs suggest that these three expectancies do not fully represent the range of reported fear-relevant beliefs about outcomes during contact with fear-relevant stimuli (e.g., Lipsitz et al., 2002). The current study supports the idea that most if not all outcome expectancies can be encompassed by five categories: physical injury; panicky bodily sensations; contamination or illness; losing mental control or "go crazy;" and being ridiculed, criticized, or judged by others.

The FASS has several advantages over prior methods of measuring expectances. First, this is a paper-and-pencil measure and as such may reduce the chance of biased responding that can occur during interviews. For example, in response to an open-ended question (e.g., "What are you most concerned will happen?"), a respondent may feel compelled to report the expectancy he or she thinks would be most reasonable to the interviewer (Lipsitz et al., 2002). Secondly, compared to the Lipsitz et al. (2002) method, respondents can rate several different expectancies instead of only identifying a primary expectancy.

Furthermore, the use of a 5-point Likert-type rating scale allows for participants to rate the relative likelihood of various possible outcomes, rather than simply listing those that are worrisome. For example, using interview methods, McNally & Steketee (1985) reported that 41% of animal phobics feared experiencing both panic and physical attack if confronted with their feared animal. However, the results were unclear regarding whether these expectancies were equivalent or whether one was a primary concern. Use of the FASS in a similar study would provide the researcher information regarding the *relative* likelihood of various outcomes, as perceived by the respondent.

Reports of individuals reporting high fear concerning their outcome expectancies using the FASS replicated findings using other means both with clinical and non-clinical populations. For example, individuals reporting strong fears of public speaking also reported that outcomes involving criticism, ridicule, or embarrassment in social situations were very likely (cf. Foa, et al., 1996). Those fearing injections reported that panicky sensations were likely if faced with a needle (cf. Lipsitz, et al., 2002). Those reporting high fear of snakes reported that they were likely to experience panicky sensations, but also (secondarily) that bodily harm may result. It is notable that the primary focus on panicky bodily sensations is counter to historical accounts of "harm" as the primary outcome expectancy for animal phobics (Thorpe & Salkovskis, 1997). A possible reason for this discrepancy is that previous studies have not adequately queried about apprehension based on panic. For example, Thorpe and Salkovskis (1995) instructed 25 animal phobics to rate their phobic beliefs on three questionnaires tapping harm, coping, and disgust. Interestingly, the 14-item "harm" questionnaire had two items tapping physical reactions (e.g., "I would feel faint," "I would have a heart attack.") that were rated more highly in conviction than one item specifically rating physical harm ("I would come to physical harm."). In sum, although outcome expectancies for the participants in the current study primarily matched those found throughout the literature, results of the present study challenge the traditional expectation that snake fear-related outcome expectancies are based on concerns about physical harm.

One interesting finding concerning the FASS was that the expectancy of panicky bodily sensations was a particularly robust predictor of all fears. One interpretation of this finding is that individuals who expect to experience panic in a particular situation are more likely to report fear and avoidance of that situation. This is consistent with the "fear of fear" phenomenon in panic disorder with agoraphobia in which fear becomes potentiated due to concerns about becoming fearful (Goldstein & Chambless, 1978). On the other hand, the strong relationship between expectancies of panic and fearfulness in this study may simply demonstrate that expectancies of panicky bodily sensations are an epiphenomenon of diffuse discomfort one feels when confronted with feared stimuli. It may prove helpful to reword this expectancy to isolate the experience in question as a "panic attack" to reduce the chance of the phrase being interpreted as an expectancy of generally feeling apprehensive or fearful.

The expectancy classification scheme offered by the FASS provides several applications for research. For example, the FASS can be used to quickly screen participants' beliefs concerning outcomes to differentiate phobic avoidance related to agoraphobia vs. specific phobia. McNally and Louro (1992) observed that fear of flying was associated with concerns about panic attacks for agoraphobic patients whereas those with flying phobia were more fearful of a plane crash. The FASS could be used to examine outcome beliefs that differentiate agoraphobic and specific phobic patients for any number of situations. Another application could be the determination of whether different outcome expectancies relate to different fear reactions. For example, researchers could screen dog phobics with the FASS to examine whether individual differences in expectancies (e.g., getting bitten vs. contaminated) predicted different avoidance strategies or physiological reactions in response to dog-related stimuli. The FASS can also be used to determine the relative impact of each expectancy type on fear responses. Prior studies have tended to examine the effects of one or two expectancies (e.g., Gursky & Reiss, 1987) or queried only what the individual was "*most* concerned will happen [italics added]" (Lipsitz et al., 2002). It would be instructive for future studies to examine whether the five category classification scheme is appropriate to use with a clinical sample and a wider range of fears.

Another application of the FASS is that the five categories of expectancies can be used as a heuristic in clinical work. Individuals seeking treatment for phobias may have a difficult time identifying their primary expectancy in response to an open ended query by a clinician, and may simply provide a response based on the answer they perceive is most common or acceptable to the clinician (Lipsitz et al,. 2002). Providing guiding classifications and examples may aid the patient in identifying his or her apprehensions. Furthermore, instead of having the patient only identify his or her primary expectancy, which may miss nuances relevant to treatment planning, allowing the patient to rate several expectancies may provide a more complete clinical picture. For example, a patient may remark that his fear of dogs is primarily due to a fear of being bitten. If the clinician does not also query about contamination expectancies, she may miss some patient's additional expectancy of contracting rabies or another disease secondary to being bitten by the dog. Certainly, a skilled clinician will be thorough and flesh out these subtleties. Nonetheless, an important reason for developing a taxonomy of mental disorders lies in the advantage of being able to aid the pairing of specific clinical phenomenon with the best treatment available.

One question left unanswered by this study is whether the five expectancy categories on the FASS represent all possible expectancies. This study included 13 common fears representing four fear subtypes; however, the current study and the pilot study did not query all possible phobic stimuli. Anecdotally, one can probably imagine how outcome expectancies related to other common or exotic phobias such as emetophobia (vomit) or coulrophobia (clowns) may fit into the five categories on the FASS. More importantly, there are indications in the phobia literature that indicates that the five outcome expectancies on the FASS are encompassing for most common fears that were not assessed in the current study, such as fears of heights and dogs (Lipsitz et al., 2002). However, further research is necessary before it can be concluded that the FASS encompasses all possible outcome expectancies related to fears.

Predicting Fearfulness from Expectancies and Sensitivities

For each fear subtype, bivariate correlations between fears, sensitivities, and expectances were, by-and-large, positive and significant. Although this may indicate a shared underlying mechanism such as negative affectivity (Watson & Clark, 1984) or systematic error in the form of method variance (Campbell & Fiske, 1959; P. Podsakoff, MacKenzie, Lee, & N. Podsakoff, 2003), for our purposes it simply demonstrates that individually, these variables have poor specificity in predicting fear subtypes. This is an important consideration for drawing conclusions from studies of fears involving a limited number of predictors, in that the chances of spurious relationships may be increased.

Simultaneous multivariate regression provides a method for exploring unique contributions of multiple variables, but as discussed previously, can hide complex relationships between variables. Hierarchical multivariate regression can help tease out these complex relationships, although decisions concerning order of entry may be difficult (if not arbitrary) and strongly affects interpretability of results. In Experiment 1, hierarchical multivariate regression demonstrated the unique relationships between predictors and fears but also suggested that expectancies, as a block, mediated the relationship between sensitivities and fears. To clarify these relationships, Experiment 2 employed path analysis within the context of expectancy theory. Although results did not improve the proportion of variance accounted for in fears, results indicate that within the context of expectancy theory, fears are better predicted by mediated relationships between sensitivities and expectancies rather than interactions.

These results have several applications to the study of fears and phobias. For example, this approach may be useful in classifying fears that do not clearly fit any one of the current fear subtypes. For example, in several exploratory factor analyses of the 52-item FSS-III conducted in our lab, the "fear of crowds" sometimes factors with social situations and sometimes with claustrophobia-related items. Exploratory factor analysis may not be the best method to determine the classification of fears in this regard, considering limitations such as assumptions of univariate and multivariate normality and the difficulty of selecting a wide enough range of items to truly characterize the underlying structure of fears. The DSM-IV task force used several sources for determining specific phobia subtypes, such as age of onset, gender specificity, and other clinical correlates (Craske et al., 1996). The current study may offer another, statistical option. If we look at bivariate correlations alone, it is likely that most correlations will be moderate and positive, as was found in Experiment 1, and there will only be a modest and arbitrary discrimination between fears. However, by looking at relationships between these variables, we may be able to make a clearer distinction. For example, if fear of crowds is associated with social fears, we might expect that fear of negative evaluation will predict fear of crowds, and furthermore, that relationship will be mediated by expectancies of ridicule, criticism, or embarrassment.

Results of this study can also be applied to the development and modification of other fear questionnaires, such as the Snake Avoidance Questionnaire (SNAQ; Klorman, Hastings, Weerts, Melamed, & Lang, 1974) and the Social Phobia Scale (SPS; Mattick & Clarke, 1998). These sorts of questionnaires often mix together questions relevant to psychological traits ("I worry I might do something to attract the attention of others."), outcome expectancies ("I am worried people will think my behaviour odd."), and emotional salience of the stimuli ("I would get tense if I had to carry a tray across a crowded cafeteria.") into one index. Results of the current study, in contrast, suggest that it may be useful to consider the relationships between these subsets of questions. For example, perhaps the expectancy of embarrassment mediates the relationship between a generalized sensitivity to negative evaluation and becoming tense and nervous in a variety of social situations. Clearly this is speculative, although such an analysis might prove useful in improving the psychometric properties of fear questionnaires during future modification or development.

The results of this study may also help explain why certain fears tend to factor together on fear surveys. There is an expectation that when fear items factor together, it implies a unitary underlying mechanism (Cattell, 1978; Merckelback & de Jong, 1997). This view is consistent with results from genetic studies of fear and phobias, which generally indicate a general genetic liability for "fear proneness" in addition to unique genetic liability for each fear subtype (e.g., Kendler et al., 2002). However, in conflict with that view, results of this study and others (e.g., Taylor, 1993) suggest that multiple trait-like vulnerabilities have additive effects that are particularly relevant for certain types of fears. In addition, it is possible that both fears *and* sensitivities are expressions of a more fundamental genetic liability. Future studies are necessary to explore this issue further.

Future Research

There are three assumptions of expectancy theory that were not directly examined in this study, but will require attention in future studies. First, there is a presumption that certain expectancies are associated with particular fear subtypes for all participants. For example, it was expected that contamination expectancies would be particularly relevant for individuals who feared disgust-relevant animals and BII stimuli. For the most part, the data supported this claim. However, one issue not approached in this study was individual differences in expectancies. For example, whereas many individuals with a dog phobia may have a strong expectation of being bitten, others may find dogs to be intolerably dirty and germ-ridden and therefore expect contact to result in contamination. Certainly, one advantage of using the FASS in research is that such group differences can be readily explored.

Secondly, expectancy theory assumes that sensitivities and expectancies will equally predict fear, phobic avoidance, and other responses to fear-relevant stimuli. This study used a self-report questionnaire to measure fears: "Rate each item for how much you are disturbed by it nowadays." There is a significant advantage in using the term "disturbed" instead of "feared" as it allows the respondent to focus on the overall negative affect without struggling to differentiate between "fear" and all other potential emotions such as disgust and embarrassment. Although in this manuscript the term "fear" was used when discussing the FSS-III, there is some indication that respondents have a difficult time differentiating between various negative emotions (Tolin et al., 1997). Nevertheless, it will be important to test whether the mediated relationships observed in Experiment 2 will also hold true when other dependent measures are used such as avoidance behavior, SUDs ratings, and physiological responses. It is interesting to note that in one study of expectancy theory, danger expectancy, anxiety expectancy, and the interaction between anxiety sensitivity and anxiety expectancy predicted avoidance behavior but not heart rate reactivity or self-reported fear for claustrophobics who were asked to walk down a dark, narrow hallway (Valentiner et al., 1993). However, considering that predictions about the intensity of fear are often inflated in phobic individuals (e.g., Telch et al., 1994), the significant relationship between anxiety expectancy and avoidance behavior in the Valentiner and colleagues (1993) study may have resulted from an inflated anxiety expectancy and an exaggerated expectation of fear (and thus avoidance) (e.g., Pauli, Wiedemann, & Montoya, 1998). With this in mind, it may be expected that measures of in vivo self-reported fear or physiological reactivity may provide a more accurate measure of fearfulness.

A third assumption of expectancy theory in need of further study is that expectancies are flexible in comparison to the more stable, trait-like sensitivities. Little is known about the resilience of these cognitions outside of the fact that treatment for phobias usually has an effect on cognitions related to the fear-stimulus and without treatment they tend to endure. The traditional view was adopted for the current study in that sensitivities are trait-like, enduring, and potentially heritable and expectancies are flexible and develop secondarily to experiences. However, caution needs to be applied to this assumption until this issue is better understood. For example, if it were the case that sensitivities and expectancies share genetic influence, the idea that expectancies mediate the sensitivities-fears relationship would no longer be valid. It is likely that future studies will continue to demonstrate advances in research designs that will further our conceptualization of the relationships between traits, biological vulnerabilities, cognitions, and fears.

Summary

The purpose of this study was to test an influential model of fears, Reiss' expectancy theory. Although it was clear that trait-like vulnerabilities (i.e., sensitivities) and outcome expectancies account for considerable amounts of variance in individual differences in fears, the premise that fears can be predicted from the interaction between sensitivities and expectancies was not supported in Experiment 1. Considering that several prior studies have also failed to support the tenets of expectancy theory, one conclusion drawn from this study is that the interactions between sensitivities and matching expectancies do not predict fears beyond the effects of sensitivities and expectancies alone. Nevertheless, expectancy theory provides a heuristic for the identification of trait-like vulnerabilities and fear-relevant outcome expectancies. Individually, there is strong support for the relationships between sensitivities and fears. Furthermore, there is substantial evidence that fear-relevant expectancies can be categorized and that those categories differentiate between fear subtypes. Experiment 1 left the question open, however, concerning how sensitivities and expectancies are related in their association with fear.

Experiment 2 tested a mediation model of expectancy theory. The model was not supported by the data, in large part due to substantial correlations between expectancies and other expectancies or unmatched sensitivities. However, relationships between paired variables in the models (e.g., injury sensitivity, expectancies of physical injury, and animal fears), were able to discriminate between fear subtypes. Furthermore, these results are more consistent with various theories of fears and panic (e.g., Clark, 1988; cf. Barlow, 2002) than with Reiss' moderation model.

It is commonly assumed that anxiety sensitivity and the other sensitivities are trait-like vulnerabilities that act as a diathesis for fears. Whether sensitivities reflect genetic predispositions, prepared fears, or diatheses related to early development remain to be determined. However, it is notable that results of this study do not support a strictly non-associative account of fears, as sensitivities were in most cases at least partially mediated by fear-relevant beliefs (i.e., expectancies). Whether non-associative accounts for the etiology for fears can accommodate cognitive mediators is yet to be explored.

Expectancies, on the other hand, are thought to be developed through experience. However, their stability relative to fear-associated traits and their potential for shared underlying vulnerability with fears and sensitivities has not been adequately examined. Future studies will need to examine more closely whether associated expectancies, sensitivities, and fears are simply different facets of the same mechanism. That is, perhaps each of these constructs, the trait, the cognition, and the emotion, are epiphenomena of a shared genetic or biological vulnerability.

Disgust sensitivity was associated with animal and BII fears whereas contamination expectancies were associated specifically with BII fears. These results support the idea that disgust sensitivity provides an impetus to avoid stimuli that can spread disease or other contaminants (Matchett & Davey, 1991). However, the fact that the relationship between disgust sensitivity and animal fears was not mediated by contamination expectancies requires further exploration. For example, perhaps contamination expectancies would be associated with disgust-relevant animals but not with aggressive animals.

One of the more fruitful outcomes of this study was the development of an inventory for fear-relevant expectancies, the Focus of Apprehension Survey Schedule (FASS). More of a versatile system than a measure, the phobic stimuli rated by the respondent can be chosen by the researcher or clinician depending on the purpose. At the core of the measure are five expectancies, which represent the bulk of, if not all, potential outcome expectancies. These five expectancies are rated by the respondent on the likeliness of the target outcome occurring. The FASS has several applications both in research and in clinical work.

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Appendix A

It was predicted that a confirmatory factor analysis of the ASI (11-item) will support a two-factor solution over a one-factor solution: 1. sensitivity to anxiety-related cognitions (ASI-COG) and 2. sensitivity to anxiety-related physical symptoms (ASI-PHY).

A confirmatory factor analysis (CFA) implemented in LISREL 8.54 (Jöreskog & Sörbom, 2003) was conducted to test the hypothesis that a two-factor solution provided a better fit to the data than a one-factor (i.e., scale) solution for the 11-item ASI. Item numbers below refer to the item in the original 16-item ASI (Reiss et al., 1986). Items were assigned to the two subscales according to results of a principal components analysis with oblimin rotation using an archival data set collected in our lab. Results of this analysis closely matched findings of published studies (Blais et al., 2001; Keogh, 2002; Schmidt & Joiner, 2002). The first factor was expected to tap the sensitivity to physical symptoms of anxiety (ASI-PHY) and include six items (items 3, 4, 6, 9, 10, 14; Figure A1). The second factor was expected to be associated with the sensitivity to anxiety-related cognitions (ASI-COG) and include five items (items 2, 11, 12, 15, 16; Figure A1).

Parameters were estimated using maximum likelihood (ML) estimation and were based on the covariance matrix. Model fit was assessed by several common indices: Full Information ML χ^2 (chi-square) index, Non-Normed Fit Index (NNFI; Bentler & Bonnet, 1980), Comparative Fit Index (CFI; Bentler, 1990), Goodness-of-Fit Index (GFI; Bentler, 1983), and the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993). Generally accepted guidelines for fit index cutoff scores were used (Kline, 2005, but see Quintana & Maxwell, 2000 for cautionary notes) to evaluate model fit (NNFI > .90, CFI > .90, GFI > .90, RMSEA < .08). The χ^2 difference test was employed to provide a significance test of the relative goodness of fit between the two competing models. Listwise deletion was employed for four cases with missing data, resulting in an $N = 421$.

Support was found for the two-factor model, $\chi^2(43, N = 421) = 214.57, p < .01$, RMSEA = 0.10, AIC = 260.57, NNFI = 0.90, CFI = 0.92, GFI = 0.92. In contrast, marginal support was attained for the one-factor model, $\chi^2(44, N = 421) = 504.00, p < .01$, RMSEA = 0.16, AIC = 548.00, NNFI = 0.80, CFI = 0.84, GFI = 0.82. A χ^2 difference test indicated that the two-factor model was superior to the one-factor model, $\chi^2\Delta(1) = 289.43, p < .001$. An evaluation of the modification indices for the two-factor model suggested that estimating additional paths between factors and items would improve model fit, reflecting cross loadings for items 3, 14, 11, and 16. Although several significant cross loadings were observed, factor loadings were larger for predicted paths. Item 11 perhaps stands out as having marginal discrimination but also because it inherently appears more related to physical symptoms, although it demonstrates a primary (and predicted) loading on the cognitive factor. Nevertheless, the loading of item 11 on the scale related to anxiety-related cognitions is consistent with the two-factor ASI model proposed by Keogh (2002). Post hoc modifications were performed, resulting in an improved fit, $\chi^2(39, N = 421) = 160.57, p < .01$, RMSEA = 0.09, AIC = 214.57, NNFI = 0.92, CFI = 0.94, GFI = na, $\chi^2\Delta(4, N = 421) = 54.00, p < .01$). The two latent factors were correlated at 0.38, $p < .01$, sharing about 14% covariance. Standardized parameter estimates are presented in Table A1.

In summary, results indicate that as expected, a two-factor solution for the ASI is statistically supported, corresponding to the predicted sensitivity to physical symptoms of anxiety and the sensitivity to anxiety-related cognitions. Results from this analysis were used in the construction of two separate ASI scales as described in Experiment 1.

1. It is important for me not to appear nervous.
*2. When I cannot keep my mind on a task, I worry that I might be going crazy.
*3. It scares me when I feel "shaky" (trembling).
*4. It scares me when I feel faint.
5. It is important for me to stay in control of my emotions.
*6. It scares me when my heart beats rapidly.
7. It embarrasses me when my stomach growls.
8. It scares me when I am nauseous.
*9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack.
*10. It scares me when I become short of breath.
*11. When my stomach is upset, I worry that I might be seriously ill.
*12. It scares me when I am unable to keep my mind on a task.
13. Other people notice when I feel shaky.
*14. Unusual body sensations scare me.
*15. When I am nervous, I worry that I may be mentally ill.
*16. It scares me when I am nervous.

Figure A1. Item from the Anxiety Sensitivity Index. Items used in the 11-item ASI are marked with an asterisk "*".

Table A1

Standardized Parameter Estimates for the Two Factor Model of the 11-Item ASI

Items	ASI-PHY	ASI-COG	R^2
3. It scares me when I feel "shaky" (trembling).[a]	0.52**	0.23**	0.41
4. It scares me when I feel faint. [a]	0.65**		0.42
6. It scares me when my heart beats rapidly. [a]	0.79**		0.63
9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack. [a]	0.60**		0.36
10. It scares me when I become short of breath. [a]	0.67**		0.45
14. Unusual body sensations scare me. [a]	0.38**	0.29**	0.31
2. When I cannot keep my mind on a task, I worry that I might be going crazy. [b]		0.68**	0.48
11. When my stomach is upset, I worry that I might be seriously ill. [b]	0.20**	0.35**	0.22
12. It scares me when I am unable to keep my mind on a task. [b]		0.76**	0.58
15. When I am nervous, I worry that I may be mentally ill. [b]		0.55**	0.30
16. It scares me when I am nervous. [b]	0.19**	0.48**	0.33

Note. ASI-PHY = "sensitivity to anxiety-related physical symptoms." ASI-COG = "sensitivity to anxiety-related cognitions."

[a]Items predicted to comprise the ASI-PHY scale. [b]Items predicted to comprise the ASI-COG scale.

* $p < .05$. ** $p < .01$.

Appendix B

Table B1.
Mean Expectancy Ratings by Select Fears.

	Public Speaking		Snakes		Injections		Enclosed Spaces	
Expectancy	*M*	*Md*	*M*	*Md*	*M*	*Md*	*M*	*Md*
Be physically injured in some way	1.6	1.0	2.3	2.0	3.5	4.0	2.3	2.0
Experience panicky bodily sensations	4.6	5.0	4.3	5.0	4.3	4.5	5.0	5.0
Experience disgust or revulsion	2.2	2.0	3.8	4.0	3.6	4.0	2.3	2.0
Lose control or feel like I was 'going crazy'	2.4	3.0	2.9	3.0	3.3	3.5	3.0	3.0
Feel embarrassed	4.8	5.0	1.9	1.0	2.5	3.0	1.7	2.0
N	14		21		10		3	

Note. Range of scores is 1 (low) to 5 (high). *Md* = median.

Appendix C

Factor analyses of the full 52-item FSS-III generally extract four or five factors that include these four factors (typically "claustrophobia" is subordinate to a broader "agoraphobia" or "situational" factor). However, considering the popularity of this measure as an index of general fearfulness (e.g., Cook, Hawk, Davis, & Stevenson, 1991), a clinical outcome measure (e.g., Carrigan & Levis, 1999), and in research of the structure of anxiety disorders (Zinbarg & Barlow, 1996) there is a surprising lack of concern that the FSS-III also demonstrates considerable variation in the structure and loadings of these factors (Arrindell, 1980).

It was predicted that a confirmatory factor analysis of select items from the Fear Survey Schedule-III would support the existence of four distinct fear subtypes over a one-factor solution: animal, BII, claustrophobic, and social. A confirmatory factor analysis (CFA) strategy was employed to test the hypothesis that a four-factor solution for a selection of FSS-III items would provide a better fit to the data than a one-factor solution. For the current study, a subset of items from the FSS-III (with the addition of "tunnels") was chosen because they appear to be most indicative of their fear subtype, as determined by a literature review and observation through previous work in our lab. Item numbers below refer to item numbers from the expanded 56-item FSS-III presented in Figure C1. The four factors were expected to correspond to four fear subtypes: disgust-relevant animals (items 13, 29, and 45), BII (items 1, 22, 36, 38), claustrophobia (items

35, 40, 56), and social fears (items 5, 10, 27). Listwise deletion was employed for two cases with missing data, resulting in an $N = 423$.

The four-factor model provided a good fit to the data, $\chi^2(59, N = 425) = 98.58, p < .01$, RMSEA = 0.04, AIC = 162.58, NNFI = 0.97, CFI = 0.98, GFI = 0.97. In contrast, marginal support was attained for the one-factor model, $\chi^2(65, N = 423) = 531.27, p < .01$, RMSEA = 0.13, AIC = 583.27, NNFI = 0.73, CFI = 0.77, GFI = 0.84. A χ^2 difference test indicated that the four-factor model was superior to the one-factor model, $\chi^2\Delta(6, N = 421) = 432.69, p < .001$. An evaluation of the modification indices for the four-factor model suggested that adding a path from the claustrophobia latent variable to item 22 "others injected" would improve the fit of the model. The addition of the path resulted in an improved fit, $\chi^2(58, N = 423) = 88.16, p < .01$, RMSEA = 0.04, AIC = 154.16, NNFI = 0.97, CFI = 0.98, GFI = 0.97, $\chi^2\Delta(1, N = 423) = 10.42, p < .01$). The additional path between claustrophobia and "others injected" ($\beta = .15$) was considerably smaller than the predicted path between BII fears and "others injected" ($\beta = .57$), suggesting that "others injected" is best characterized as a BII fear, as hypothesized. Standardized parameter estimates are presented in Table C1 and interfactor correlations are presented in Table C2.

In summary, a four-factor model of a modified, 13-item Fear Survey Schedule-III (FSS-III) was found to be superior to a one-factor model. Although inter-factor correlations of .25 to .47 were observed, these fear subtypes were able to be discriminated on the basis of scores on sensitivity and expectancy measures. Although replication is necessary to support the continued use of this 13-item fear scale, the current study may be regarded as a promising first step in developing a brief fear survey with the advantage of a stable, consistent factor structure. Nevertheless, changes to this 13-item model should be considered, such as adding items to provide two separate subscales for "disgust-relevant" and "fierce" animals.

*1.	______	Open wounds	*29.	______	Crawling insects (like spiders)
2.	______	Being alone	30.	______	Sight of fighting
3.	______	Being in a strange place	31.	______	Ugly people
4.	______	Dead people	32.	______	Sick people
*5.	______	Speaking in public/Giving a speech	33.	______	Being criticized
6.	______	Crossing streets	34.	______	Strange shapes
7.	______	Falling	*35.	______	Being in an elevator
8.	______	Being teased	*36.	______	Witnessing surgical operations
9.	______	Failure	37.	______	Mice
*10.	______	Entering a room where other people are already seated	*38.	______	Human blood
11.	______	High places on land/Heights	39.	______	Animal blood
12.	______	People with deformities	*40.	______	Enclosed places
*13.	______	Worms	41.	______	Feeling rejected by others
14.	______	Receiving injections	42.	______	Airplanes
15.	______	Strangers	43.	______	Medical odors
16.	______	Bats	44.	______	Feeling disapproved of
17.	______	Journeys by train	*45.	______	Harmless snakes
18.	______	Journeys by bus	46.	______	Cemeteries
19.	______	Journeys by car	47.	______	Being ignored
20.	______	People in authority	48.	______	Nude men
21.	______	Flying insects	49.	______	Nude women
*22.	______	Seeing other people injected	50.	______	Doctors
23.	______	Crowds	51.	______	Making mistakes
24.	______	Large open spaces	52.	______	Looking foolish
25.	______	One person bullying another	53.	______	Eating in a cafeteria by myself
26.	______	Tough-looking people	54.	______	Great white sharks
*27.	______	Being watched working	55.	______	Bears
28.	______	Dirt	*56.	______	Long tunnels

Figure C1. Items from the 56-item version of the Fear Survey Schedule-III. Items used in this study are marked with an asterisk "*".

Table C1
Completely Standardized Parameter Estimates for the Four Factor Model of the FSS Items

Items	Animals	BII	Claustro-phobia	Social	R^2
13. Worms	0.44**				0.19
29. Crawling insects	0.72**				0.52
45. Harmless snakes	0.62**				0.39
1. Open wounds		0.59**			0.35
22. Seeing other people injected		0.57**	0.15**		0.39
36. Witnessing surgical operations		0.78**			0.60
38. Human blood		0.83**			0.69
35. Elevators			0.55**		0.31
40. Enclosed places			0.79**		0.62
56. Long tunnels			0.62**		0.39
5. Speaking in public				0.39**	0.15
10. Entering a room where other people are already seated				0.53**	0.29
27. Being watched working				0.56**	0.32

** $p < .01$.

Table C2
Interfactor Correlations of Fears

Items	BII	Claustrophobia	Social
Animal	.47**	.42**	.38**
BII		.25**	.41**
Claustrophobia			.38**

** $p < .01$.

Appendix D

Thank you for choosing to participate in our study!

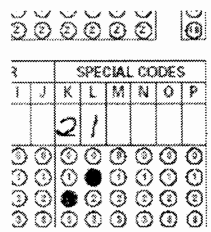
We hope that the results of this study will help psychologists understand better the ways that common fears affect people's lives, and help those seeking treatment.

Please CAREFULLY read the directions and items on each questionnaire. If you have any questions, don't hesitate to ask the experimenter.

Please record all answers on the Response Forms. A #2 pencil MUST be used (provided by the experimenter), and all answers must be filled in completely.
Please do not write in this booklet!

First, please tell us more about yourself on Answer Sheet "A"!

SEX: Please shade appropriate bubble on Response Form.



AGE: Please enter under "SPECIAL CODES: K and L".
(for example):→

IS ENGLISH YOUR FIRST LANGUAGE? Please enter under "SPECIAL CODES: M"

Yes = "1"
No = "0"

GRADE LEVEL: Please enter under "SPECIAL CODES: N":

1= "freshman" 2= "sophomore" 3= "junior" 4= "senior" 5= "fifth year or higher"

RACE: Please enter under "SPECIAL CODES: O" the answer that best corresponds with your race or ethnicity:

1. North Asian-American	4. Black/African American	7. Other (please write your ethnicity or race on the margin of your response booklet.)
2. Hispanic/Latino	5. Native American	
3. White/Caucasian	6. Pacific Islander	

Appendix E

FASS

<u>**INSTRUCTIONS**</u>: The items on this questionnaire refer to things and experiences that may cause fear or other unpleasant feelings. Read each item carefully. Then, rate how likely you think each outcome is using the scale below FOR EACH ITEM.

not likely		somewhat likely		very likely
1	2	3	4	5

<u>**EXAMPLES FOR EACH OUTCOME:**</u>

Be physically injured.

<u>Examples</u>: being attacked, being hit by something, being physically harmed.

Experience panicky bodily sensations.

<u>Examples</u>: rapid heart beat, sweaty palms, trembling, dizziness, chills.

Become contaminated or become ill in some way.

<u>Examples</u>: catch a disease, develop an infection or parasites, become ill.

Lose mental control or "go crazy."

<u>Examples</u>: can't move or speak, difficulty concentrating, feel like you are "going crazy."

Be ridiculed, criticized, or judged by others.

<u>Examples</u>: be laughed at, humiliated, criticized, people showing disapproval.

FASS

INSTRUCTIONS: Read each item below carefully. Then, rate how likely you think each outcome is using the scale below FOR EACH ITEM.

not likely somewhat likely very likely
1 --------------- 2 --------------- 3 --------------- 4 --------------- 5

***If I encountered a harmless snake, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If other people were watching me working, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

If I were to board an airplane, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I encountered a crawling insect (like a spider), I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were in an elevator, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I saw human blood, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

If I were being criticized, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I looked at an open wound, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I encountered a worm, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

If I were in a high place like on a ladder or at the edge of a cliff, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were in an enclosed space, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were witnessing a surgical operation, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

If I encountered a wild mountain lion, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were giving a speech in public, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."

Be ridiculed, criticized, or judged by others.

If I encountered a bat, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

If I were eating in a cafeteria by myself, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were being injected, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I entered a room where other people were already seated, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or "go crazy."
Be ridiculed, criticized, or judged by others.

***If I were walking through a long tunnel, I would expect to:**

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.

Lose mental control or “go crazy.”
Be ridiculed, criticized, or judged by others.

If I saw someone else being injected, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or “go crazy.”
Be ridiculed, criticized, or judged by others.

If I encountered a wild bear, I would expect to:

Be physically injured.
Experience panicky bodily sensations (for example, rapid heart beat, sweaty palms, trembling, dizziness).
Become contaminated or become ill in some way.
Lose mental control or “go crazy.”
Be ridiculed, criticized, or judged by others.

Appendix F

The Disgust Scale, Version 2 (Haidt, McCauley and Rozin, 2002)

Please indicate how much you agree with each of the following statements, or how true it is about you. Please write a number (1, 2, 3 or 4) to indicate your answer:

1 = Strongly disagree (very untrue about me)
2 = Mildly disagree (somewhat untrue about me)
3 = Mildly agree (somewhat true about me)
4 = Strongly agree (very true about me)

____1. I might be willing to try eating monkey meat, under some circumstances.
___*2. I try to avoid letting any part of my body touch the toilet seat in a public restroom, even when it appears clean.
____3. It would bother me to be in a science class, and to see a human hand preserved in a jar.
___*4. It would make me uncomfortable to hear a couple making love in the next room of a hotel.
___*5. If I see someone vomit, it makes me sick to my stomach.
___*6. I have no problem buying and wearing shirts from used clothing stores.
___*7. It would bother me tremendously to touch a dead body.
___*8. It would bother me to see photos of two people having oral sex.
____9. Seeing a cockroach in someone else's house does <u>not</u> bother me.
___*10. I probably would not go to my favorite restaurant if I found out that the cook had a cold.
___*11. It would bother me to sleep in a nice hotel room if I knew that a man had died of a heart attack in that room the night before.
____12. It is OK with me if people want to look at pornography involving animals.
____13. Even if I was hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed fly-swatter.
___*14. I would not hold a dollar bill between my lips (like if I needed a free hand), because so many strangers have touched it with their dirty hands
____15. If I were properly trained, I would be willing to help draw blood in a blood drive.
___*16. I think that people who masturbate every day are degrading themselves.

How disgusting would you find each of the following experiences? Please write a number (1, 2, 3, or 4) to indicate your answer: **1** = Not disgusting at all, **2** = Slightly disgusting, **3** = Moderately disgusting, **4** = Very disgusting. If you think something is bad or unpleasant, but not disgusting, you should write "**1**".

____17. You see maggots on a piece of meat in an outdoor garbage pail.
___*18. You take a sip of soda and then realize that you picked up the wrong can, which a stranger had been drinking out of.
____19. You see someone accidentally stick a fishing hook through his finger.
___*20. You hear about a 30 year old man who seeks sexual relationships with 80 year old women.

___*21. While you are walking through a tunnel under a railroad track, you smell urine.
___*22. You sit down on a public bus, and feel that the seat is still warm from the last person who sat there.
____23. You see a man with his intestines exposed after an accident.
___*24. As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth.
____25. A friend offers you a piece of chocolate shaped like dog-doo.
___*26. You find out that someone you despise used to live in your house, and sleep in your bedroom.
____27. Your friend's pet cat dies, and you have to pick up the dead body with your bare hands.
___*28. You hear about an adult brother and sister who like to have sex with each other.
___*29. You see a bowel movement left unflushed in a public toilet.
___*30. While traveling for 2 weeks with a friend, you discover that your underwear got mixed up in the wash, and you are wearing your friend's underwear.
___*31. You accidentally touch the ashes of a person who has been cremated.
____32. While walking through a park, you see two dogs mating (having sex).

Items used in this study are marked with an asterisk "*".

Appendix G

Items on the Injury Sensitivity Index

1. I am frightened of being injured.
2. The thought of physical illness scares me.
3. I worry about being injured
4. I worry about becoming physically ill.
5. It would be awful to be injured in any way.
6. I worry about my physical health.
7. I get scared if I think I am coming down with an illness.
8. The thought of injury terrifies me.
9. I worry that I might get a serious physical illness in the future.
10. It would be awful to have a serious physical illness.
11. I can’t stand the thought of being injured.

Appendix H

Items on the Brief Fear of Evaluation Questionnaire

1. I worry about what people will think of me even when I know it doesn't make any difference.
2. I am frequently afraid of other people noticing my shortcomings.
3. I am afraid that others will not approve of me.
4. I am afraid that people will find fault with me.
5. When I am talking to someone, I worry about what they may be thinking about me.
6. I am usually worried about what kind of impression I make.
7. Sometimes I think I am too concerned with what other people think of me.
8. I often worry that I will say or do the wrong things.

Appendix I

Table I1

Means and Standard Deviations of Study Variables (N = 425)

Variables	*M*	*SD*
Fear Subtypes		
Animal Fears	.98	.21
BII Fears	-.22	.18
Claustrophobic Fears	.40	.60
Social Fears	1.05	.17
Sensitivities		
Injury Sensitivity Index	-.55	.16
ASI-Physical Symptoms	-.31	.16
Disgust Scale-2	.23	.05
ASI- Anxiety-Related Cognitions	-1.13	.79
Brief Fear of Negative Evaluation Scale	-.42	.18
Expectancies		
Animal Fears		
Expectancies of physical injury	-.22	.16
Expectancies of panic	-.07	.19
Expectancies of contamination	.60	.27
Expectancies of losing mental control	.59	.28
Expectancies of being criticized	.57	.25
BII Fears		
Expectancies of physical injury	.35	.10
Expectancies of panic	2.95	.72
Expectancies of contamination	2.42	.70
Expectancies of losing mental control	.38	.15
Expectancies of being criticized	.36	.12
Claustrophobic Fears		
Expectancies of physical injury	.50	.17

Expectancies of panic	-.16	.17
Expectancies of contamination	.49	.15
Expectancies of losing mental control	.55	.21
Expectancies of being criticized	.49	.15
Social Fears		
Expectancies of physical injury	.49	.08
Expectancies of panic	1.03	.19
Expectancies of contamination	.53	.15
Expectancies of losing mental control	.58	.21
Expectancies of being criticized	1.03	.23

Note. Values represent weighted and (where appropriate) transformed measures. ASI = "Anxiety Sensitivity Index."

Appendix J

Table J1

Summary of Hierarchical Regression Analysis for Variables Predicting Animal Fears (N = 425)

	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step1							.089***	.089	0.87
sex	.614	.096	.299***	.426	.802	0.089			
Step2							.100***	.189	.179
Sex	.455	.096	.222***	.266	.644	0.044			
Injury Sensitivity Index	.201	.053	.201***	.097	.304	0.029			
ASI-Physical Symptoms	.203	.054	.203***	.097	.308	0.028			
ASI- Anxiety-Related Cognitions	-.006	.053	-.006	-.109	.097	0.000			
BFNE	-.089	.048	-.089†	-.184	.005	0.007			
Step3							.334***	.523	.512
Sex	.267	.076	.130***	.118	.416	0.014			
Injury Sensitivity Index	.051	.042	.051	-.031	.133	0.002			
ASI-Physical Symptoms	.047	.042	.047	-.037	.130	0.001			
ASI- Anxiety-Related Cognitions	-.027	.041	-.027	-.107	.053	0.000			
BFNE	-.049	.037	-.049	-.122	.024	0.002			
expectancy A	.084	.045	.085†	-.004	.173	0.004			
expectancy B	.489	.045	.493***	.400	.577	0.138			
expectancy D	.068	.051	.069	-.032	.169	0.002			
expectancy E	.118	.046	.117**	.028	.208	0.008			
Step 4							.014**	.537	.524
Sex	.212	.077	.103**	.061	.363	0.009			
Injury Sensitivity Index	.035	.042	.035	-.047	.117	0.001			
ASI-Physical Symptoms	.036	.042	.036	-.047	.118	0.001			

Disgust Scale-2	.136	.038	.136***	.060	.211	0.014			
ASI- Anxiety-Related Cognitions	-.041	.040	-.041	-.120	.039	0.001			
BFNE	-.043	.037	-.043	-.116	.029	0.002			
expectancy A	.078	.051	.079	-.021	.178	0.003			
expectancy B	.476	.045	.480***	.388	.563	0.129			
expectancy C	-.004	.052	-.004	-.106	.098	0.000			
expectancy D	.057	.052	.057	-.045	.159	0.001			
expectancy E	.110	.046	.109*	.020	.200	0.007			
Step 5							.012†	.549[a]	.531
Sex	.215	.077	.105**	.064	.365	0.009			
Injury Sensitivity Index	.044	.041	.044	-.037	.125	0.001			
ASI-Physical Symptoms	.030	.042	.030	-.053	.113	0.001			
Disgust Scale-2	.131	.038	.131***	.056	.206	0.013			
ASI- Anxiety-Related Cognitions	-.037	.040	-.037	-.116	.043	0.001			
Sex	-.059	.037	-.059	-.132	.014	0.003			
expectancy A	.065	.051	.065	-.034	.165	0.002			
expectancy B	.465	.045	.469***	.377	.553	0.122			
expectancy C	.035	.055	.035	-.072	.143	0.000			
expectancy D	.061	.055	.061	-.046	.169	0.001			
expectancy E	.117	.046	.116*	.025	.208	0.007			
ISI x expectancy A	.072	.038	.075†	-.002	.147	0.004			
ASI-PHY x expectancy B	-.028	.033	-.030	-.093	.037	0.001			
DS x expectancy C	-.112	.037	-.118**	-.185	-.039	0.010			
ASI-COG x expectancy D	-.002	.035	-.002	-.071	.067	0.000			
BFNE x expectancy E	-.007	.039	-.006	-.083	.070	0.000			

Note. expectancy A = expectancies of physical injury; expectancy B = expectancies of panic; expectancy C = expectancies of contamination; expectancy D = expectancies of losing mental control; expectancy E = expectancies of being criticized; ASI = Anxiety Sensitivity Index; BFNE = Brief Fear of Negative Evaluation.

[a]$R = .741$, $F(16,403) = 30.68$, $p < .001$.

† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table J2

Summary of Hierarchical Regression Analysis for Variables Predicting BII Fears ($N = 425$)

	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step1							.021**	.021	.019
sex	.300	.100	.146**	.104	.496	0.021			
Step2							.093***	.115	.104
Sex	.157	.101	.076	-.041	.355	0.005			
Injury Sensitivity Index	.099	.055	.099†	-.009	.207	0.007			
ASI-Physical Symptoms	.252	.056	.252***	.142	.362	0.043			
ASI- Anxiety-Related Cognitions	-.018	.055	-.018	-.126	.090	0.000			
BFNE	.034	.050	.034	-.065	.133	0.001			
Step3							.370***	.484	.473
Sex	.132	.078	.064†	-.022	.285	0.004			
Injury Sensitivity Index	.037	.042	.037	-.046	.120	0.001			
ASI-Physical Symptoms	.083	.044	.083†	-.004	.170	0.004			
ASI- Anxiety-Related Cognitions	-.060	.042	-.061	-.144	.023	0.003			
BFNE	-.014	.039	-.014	-.090	.062	0.000			
expectancy A	-.121	.049	-.119*	-.217	-.024	0.008			
expectancy B	.641	.042	.641***	.559	.722	0.299			
expectancy D	.118	.056	.118*	.008	.227	0.006			
expectancy E	-.020	.052	-.020	-.122	.082	0.000			
Step 4							.012*	.496	.483
Sex	.114	.079	.055	-.042	.270	0.003			
Injury Sensitivity Index	.022	.043	.022	-.062	.105	0.000			
ASI-Physical Symptoms	.067	.044	.068	-.020	.154	0.003			
Disgust Scale-2	.049	.040	.049	-.030	.127	0.002			
ASI- Anxiety-Related Cognitions	-.072	.042	-.072†	-.155	.011	0.004			
Sex	-.011	.039	-.011	-.087	.065	0.000			
expectancy A	-.140	.049	-.138**	-.237	-.043	0.010			
expectancy B	.606	.043	.607***	.522	.691	0.247			

expectancy C	.122	.045	.122**	.034	.209	0.009			
expectancy D	.084	.056	.084	-.027	.195	0.003			
expectancy E	-.024	.051	-.024	-.125	.077	0.000			
Step 5							.005	.502[a]	.482
Sex	.121	.080	.059	-.036	.278	0.003			
Injury Sensitivity Index	.024	.043	.024	-.060	.108	0.000			
ASI-Physical Symptoms	.063	.045	.063	-.024	.151	0.003			
Disgust Scale-2	.046	.040	.046	-.033	.124	0.002			
ASI- Anxiety-Related Cognitions	-.070	.043	-.070	-.154	.014	0.003			
Sex	-.009	.039	-.009	-.086	.067	0.000			
expectancy A	-.137	.051	-.135**	-.237	-.036	0.009			
expectancy B	.600	.043	.600***	.514	.685	0.236			
expectancy C	.141	.046	.142**	.051	.231	0.012			
expectancy D	.067	.063	.067	-.056	.191	0.001			
expectancy E	-.044	.054	-.044	-.151	.063	0.001			
ISI x expectancy A	.003	.047	.002	-.090	.096	0.000			
ASI-PHY x expectancy B	-.025	.039	-.024	-.101	.052	0.000			
DS x expectancy C	-.057	.038	-.056	-.133	.018	0.003			
ASI-COG x expectancy D	.034	.046	.035	-.055	.124	0.001			
BFNE x expectancy E	.040	.043	.037	-.044	.123	0.001			

Note. expectancy A = expectancies of physical injury; expectancy B = expectancies of panic; expectancy C = expectancies of contamination; expectancy D = expectancies of losing mental control; expectancy E = expectancies of being criticized; ASI = Anxiety Sensitivity Index; BFNE = Brief Fear of Negative Evaluation.

[a]$R = .708$, $F(16,403) = 25.34$, $p < .001$.

[†] $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table J3

Summary of Hierarchical Regression Analysis for Variables Predicting Claustrophobic Fears (N = 425)

	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step1							.047***	.047	.045
sex	.447	.098	.217***	.253	.640	0.047			
Step2							.102***	.149	.139
Sex	.317	.099	.154**	.123	.512	0.021			
Injury Sensitivity Index	.123	.054	.123*	.017	.229	0.011			
ASI-Physical Symptoms	.231	.055	.230**	.122	.339	0.036			
ASI- Anxiety-Related Cognitions	.046	.054	.046	-.060	.152	0.001			
BFNE	-.014	.049	-.014	-.111	.083	0.000			
Step3							.351***	.500	.489
Sex	.096	.079	.047	-.058	.251	0.002			
Injury Sensitivity Index	.100	.042	.100*	.017	.183	0.007			
ASI-Physical Symptoms	.057	.044	.056	-.030	.143	0.002			
ASI- Anxiety-Related Cognitions	-.018	.043	-.018	-.101	.066	0.000			
BFNE	-.086	.038	-.086*	-.162	-.011	0.006			
expectancy A	-.014	.042	-.014	-.097	.068	0.000			
expectancy B	.602	.047	.599***	.510	.693	0.204			
expectancy D	.094	.047	.094*	.003	.186	0.005			
expectancy E	.022	.042	.022	-.060	.105	0.000			
Step 4							.000	.500	.487
Sex	.088	.081	.043	-.070	.246	0.001			
Injury Sensitivity Index	.097	.043	.097*	.013	.182	0.006			
ASI-Physical Symptoms	.054	.044	.054	-.033	.141	0.002			
Disgust Scale-2	.020	.039	.020	-.056	.097	0.000			
ASI- Anxiety-Related Cognitions	-.020	.043	-.020	-.105	.064	0.000			
Sex	-.085	.039	-.084*	-.161	-.009	0.006			
expectancy A	-.016	.045	-.016	-.104	.072	0.000			
expectancy B	.600	.047	.597***	.507	.692	0.200			

expectancy C	.010	.049	.010	-.085	.106	0.000			
expectancy D	.091	.048	.091†	-.004	.185	0.004			
expectancy E	.020	.043	.020	-.065	.105	0.000			
Step 5							.002	.502[a]	.482
Sex	.085	.081	.041	-.075	.244	0.001			
Injury Sensitivity Index	.097	.043	.097*	.012	.182	0.006			
ASI-Physical Symptoms	.051	.045	.050	-.039	.140	0.002			
Disgust Scale-2	.018	.039	.018	-.060	.095	0.000			
ASI- Anxiety-Related Cognitions	-.022	.043	-.022	-.107	.063	0.000			
Sex	-.083	.039	-.083*	-.161	-.006	0.006			
expectancy A	-.020	.055	-.020	-.128	.087	0.000			
expectancy B	.605	.048	.603***	.512	.699	0.200			
expectancy C	.013	.051	.013	-.087	.113	0.000			
expectancy D	.091	.053	.090†	-.013	.194	0.004			
expectancy E	.016	.045	.015	-.072	.103	0.000			
ISI x expectancy A	.009	.037	.012	-.063	.082	0.000			
ASI-PHY x expectancy B	-.040	.036	-.042	-.111	.031	0.002			
DS x expectancy C	-.011	.040	-.011	-.090	.068	0.000			
ASI-COG x expectancy D	.010	.039	.011	-.066	.087	0.000			
BFNE x expectancy E	.014	.044	.012	-.073	.100	0.000			

Note. expectancy A = expectancies of physical injury; expectancy B = expectancies of panic; expectancy C = expectancies of contamination; expectancy D = expectancies of losing mental control; expectancy E = expectancies of being criticized; ASI = Anxiety Sensitivity Index; BFNE = Brief Fear of Negative Evaluation.

[a]$R = .709$, $F(16,403) = 25.42$, $p < .001$.

$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table J4

Summary of Hierarchical Regression Analysis for Variables Predicting Social Fears (N = 425)

	B	SE B	β	95% CI B (lower)	95% CI B (upper)	sr^2	$R^2\Delta$	R^2_{total}	Adj. R^2_{total}
Step1							.039***	.039	.036
sex	.407	.099	.197***	.212	.602	0.039			
Step2							.218***	.257	.248
Sex	.409	.093	.198***	.227	.591	0.035			
Injury Sensitivity Index	-.079	.051	-.078	-.178	.021	0.004			
ASI-Physical Symptoms	.151	.052	.150**	.049	.252	0.015			
ASI- Anxiety-Related Cognitions	.151	.051	.150**	.051	.251	0.016			
BFNE	.356	.046	.354***	.265	.447	0.106			
Step3							.229***	.486	.475
Sex	.221	.079	.107**	.066	.376	0.010			
Injury Sensitivity Index	-.096	.043	-.095*	-.179	-.012	0.006			
ASI-Physical Symptoms	.125	.044	.124**	.039	.210	0.010			
ASI- Anxiety-Related Cognitions	.030	.044	.030	-.056	.116	0.001			
BFNE	.154	.042	.153***	.072	.236	0.017			
expectancy A	-.100	.039	-.094*	-.178	-.023	0.008			
expectancy B	.456	.046	.457***	.366	.546	0.125			
expectancy D	.090	.042	.090*	.007	.173	0.006			
expectancy E	.110	.043	.110*	.026	.195	0.008			
Step 4							.004	.490	.476
Sex	.190	.081	.092*	.031	.349	0.007			
Injury Sensitivity Index	-.109	.043	-.108*	-.194	-.024	0.008			
ASI-Physical Symptoms	.116	.044	.116*	.030	.202	0.009			
Disgust Scale-2	.072	.039	.072†	-.005	.150	0.004			
ASI- Anxiety-Related Cognitions	.020	.044	.020	-.067	.107	0.000			
BFNE Scale	.159	.042	.158***	.077	.241	0.018			
expectancy A	-.108	.040	-.101**	-.186	-.029	0.009			
expectancy B	.449	.046	.449***	.358	.540	0.118			

expectancy C	.018	.043	.018	-.066	.102	0.000			
expectancy D	.086	.045	.086[†]	-.003	.175	0.004			
expectancy E	.113	.043	.113**	.029	.197	0.009			
Step 5							.006	.496[a]	.476
Sex	.177	.082	.085*	.016	.338	0.006			
Injury Sensitivity Index	-.112	.044	-.112*	-.198	-.027	0.008			
ASI-Physical Symptoms	.110	.044	.109*	.023	.196	0.008			
Disgust Scale-2	.078	.040	.078*	.000	.156	0.005			
ASI- Anxiety-Related Cognitions	.018	.044	.018	-.069	.105	0.000			
BFNE Scale	.160	.042	.159***	.077	.243	0.018			
expectancy A	-.091	.048	-.085[†]	-.185	.004	0.004			
expectancy B	.445	.047	.446***	.353	.537	0.114			
expectancy C	-.001	.044	-.001	-.088	.086	0.000			
expectancy D	.103	.052	.103*	.001	.206	0.005			
expectancy E	.104	.043	.104*	.019	.189	0.007			
ISI x expectancy A	.006	.037	.007	-.066	.078	0.000			
ASI-PHY x expectancy B	.006	.035	.006	-.063	.075	0.000			
DS x expectancy C	-.070	.038	-.070[†]	-.145	.006	0.004			
ASI-COG x expectancy D	-.015	.040	-.017	-.094	.064	0.000			
BFNE x expectancy E	.046	.036	.047	-.025	.117	0.002			

Note. expectancy A = expectancies of physical injury; expectancy B = expectancies of panic; expectancy C = expectancies of contamination; expectancy D = expectancies of losing mental control; expectancy E = expectancies of being criticized; ASI = Anxiety Sensitivity Index; BFNE = Brief Fear of Negative Evaluation.

[a] $R = .705$, $F(16,403) = 24.83$, $p < .001$.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix K

Based on an evaluation of the path coefficients, residuals matrix, and modification indices, the partial mediation model for animal fears was adjusted *post hoc* in order to improve model fit and parsimony. First, expectancies that did not have direct or indirect effects on the fear variable were removed from the model. Next, additional paths between sensitivities and expectancies were estimated as suggested by modification indices. For example, expectancies of panic and of injury partially mediated the relationships between three sensitivities and animal fears. Although modification indices suggested that paths between expectancies would improve fit, those paths were not estimated due to theoretical and statistical concerns as outlined in the Discussion section for Experiment 2. Finally, paths that were not significant in prior analyses were not estimated in subsequent adjusted models. Unfortunately, the adjusted model also resulted in a poor fit to the data (χ^2 (6) = 171.96, RMSEA = .27, NNFI = .41, CFI = .87) with no substantial improvement in the amount of variance predicted in fears (R^2 = .49). As with the model estimated in Experiment 1, examination of residuals and modification indices suggested that the poor fit for the adjusted models was largely due to unestimated covariations between expectancy variables.

Three sensitivities, three expectancies and sex were contributors to animal fears (Figure K1; Table K1). Animal fears were predicted by expectancies of being injured, expectancies of panic, expectancies of being criticized, DS, and sex. Expectations of injury were predicted by IS, sensitivity to the physical symptoms of anxiety (i.e., ASI-PHY), and DS. Expectancies of panic were predicted by IS, ASI-PHY, DS, and sex. Expectancies of criticism were predicted by ISI and DS. In partial support of a mediation model, the relationship between IS and animal fears was fully mediated by expectancies of being injured, expectations of panic, and expectancies of criticism (β for indirect effect = .12, $p < .001$). Furthermore, the relationship between ASI-PHY and animal fears was fully mediated by expectancies of being injured, expectations of panic, and expectancies of criticism (β for indirect effect = .12, $p < .001$). The DS-animal fears relationship was not mediated by expectations of contamination as hypothesized. However, the relationship between DS and animal fears was partially mediated by expectancies of being injured, expectations of panic, and expectancies of criticism (β for indirect effect = .15, $p < .001$). The model explained 49% of the variance in animal fears.

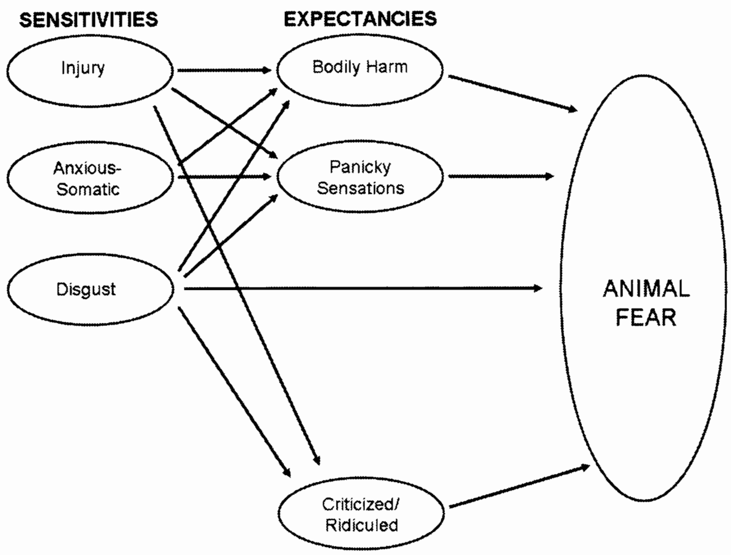


Figure K1. Significant paths for the relationships between sensitivities, expectancies, and animal fears.

Table K1
Standardized Path Coefficients for Modified Animal Fear Model

	Gamma				Beta
	Injury Sensitivity Index	ASI-Physical Symptoms	Disgust Scale 2	Sex	Animal fears
Animal fears	--	--	.15***	.12***	--
Expectancies of physical injury	.19***	.13**	.19***	-.01	.10**
Expectancies of panic	.15**	.20***	.19***	.15**	.52***
Expectancies of being criticized	.15**	--	.21***	-.03	.14***

Note. Dashes indicate the path was not estimated. ASI = "Anxiety Sensitivity Index."
† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Vita

Scott David McDonald was born August 1970 in Williamsport, Pennsylvania and graduated from South Williamsport Area High School in June 1988. He attended the University of Pittsburgh in Pittsburgh, Pennsylvania and completed a Bachelor of Science with a double major in Psychology and Religious Studies (East Asian concentration) in December 1992. After traveling, working abroad, and generally having a good time through much of the 1990s, Scott settled in Philadelphia, Pennsylvania in 1998. From 1998 through 2000 he worked as a case manager at a day program for chronic mentally ill adults and as a research technician for neuroimaging studies at the University of Pennsylvania. In the fall of 2000 Scott entered the Clinical Psychology program at VCU and completed his Masters Degree in 2003.